THE GLASS INDUSTRY

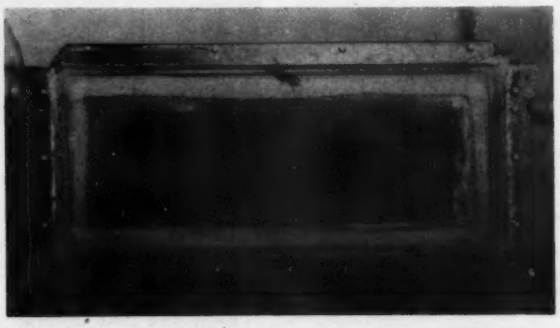
VOLUME 28, NUMBER 10, OCTOBER, 1947

DECORATING AT LAURENS

By PAUL NELSON

The application of ceramic color to carbonated beverage bottles poses two basic problems. First, the rough handling that the ware receives during its life necessitates a strong bottle with color that will not scuff or chip. Second, the small profit margins in the carbonated beverage field demand a high volume of production with a resulting low cost bottle. Successful solutions to these problems have been found by the Laurens Glass Works, Inc., of Laurens, S. C.

The firm supplies bottles to soft drink bottlers throughout the South, covering a territory from Texas to the Atlantic and from West Virginia south to the Gulf. Their designs require one-, two-, or three-color applications.



A finished screen ready for the printing machines, showing a front and back label design. Color covers this side of the screen in a shallow puddle and is pushed through the open pores of the pattern by the squeegee. The screen is attached to the printing machine by bolts through the holes shown at extreme ends.

The screens are made in a special department that has the following equipment: a Levy process camera; a Macbeth camera lamp (carbon arc type); a completely equipped dark room; a specially made whirler; two sinks; a compressed air system; a crimper; a small hand press with four banks of Gothic type.

A 165-mesh stainless steel screen material is used, in place of the traditional silk, for greater durability. The mesh is attached tautly to a steel frame, 14 by 5¾ inches, which becomes an integral part of the screen throughout its use. The mesh is first crimped solidly to the frame and burned over a gas jet to destroy any foreign matter. It is then ready for the three coats of "filler" or "sensitizer."

The label is usually a combination of a registered label that is owned by the parent beverage company plus the name and address of the bottling firm to whom the Laurens Glass Works supplies the bottles. For this latter purpose, the printing press makes the desired two or three lines, a negative is made and the negative is exposed to provide a positive for use with the main drawing. A free lance artist is available for any supplementary art work that may be needed.

The complete design is placed on the back side of the screen with Scotch tape. The screen frame is then clamped into a special frame with the back against a sheet of glass that is part of the assembly. A strong carbon arc light is thrown against the screen for 10 minutes. This process hardens the sensitizer where it is not covered by the design; the sensitizer under the design softens to the point where it can be washed out of the screen with cold water and compressed air. It is then washed thoroughly, leaving the label exposed as bare screen surrounded by a thick coating of filler. A final hardening of the filler with another application of heat completes the process.

A strip of mill cloth is cemented around the edges of the finished screen with PVA solution to prevent leakage of color and a supporting tape is placed horizontally along the under side (which contacts the bottle) to give the screen longer life.

The longevity of a screen is varied according to the

The Solar printer applies the third color to Pepsi-Cola bottles. Note the spindle chuck, directly to the right of the bottles, that helps to correlate the spinning of the bottle with the horizontal movement of the screen and squeegee.

type of bottle, size of design, condition of decorating machine and other factors. A separate screen is required, of course, for each color in the design.

Ceramic color used at the Laurens plant is supplied by B. F. Drakenfeld & Company, Inc., and the Electrochemicals Department of E. I. du Pont de Nemours & Company, Inc. The powder is first placed in a drier to take out any chance moisture; the presence of moisture in the color would be likely to result in a loose union with the bottle. The powder is then mixed with "squeegee oil" to a proper fluid consistency that can be handled readily by is obtained by running the mixture twice through a J. H. the squeegees of the printing machines. Final smoothness Day paint mill.

Preparation of the screen and paint is preliminary to the principle job of applying and firing the color to the bottles in the big main section of the decorating building. The plant is arranged so that the bottle is decorated in one long trip along a conveyor line and the firing process takes the bottle back through the lehr to the original starting point. There are five lines, from one to three colors each.

The cases of ware are brought from the adjacent factory building on pallets and placed close to the first

Two of the five production lines converge at right beside the mouth of the lehr. Each of these lines is running a two-color label. The girls at extreme right are inspecting the bottles and loading the accepted ones on the lehr conveyor. At extreme left, the first color is being applied and the bottles are passing through the drying and cooling tunnels on their way to the second machine.

decorating machine. As the cartons are emptied, they are again stacked on the pallets until needed at the nearby discharge end of the lehr.

Decorating is done by semi-automatic Solar decorating machines. The operator places the bottle in horizontal position under the screen with the bottom against a revolving chuck. An arm then swings a second chuck snugly into the neck of the bottle to hold it firmly while it revolves. The screen then slides horizontally across the bottle as the bottle spins in a full turn while a rubber squeegee slides along the upper side of the screen to force the color through the mesh to the bottle. The three actions, the turn of the bottle, the sideward motion of the screen and the corresponding motion of the squeegee, are all synchronized. This is accomplished by the use of pulleys and thin steel cables as the power source for the screen and squeegee. The pulleys are cut to the exact diameter of the bottle, which assures correct correlation of the three movements.

Bottles are placed carefully on the lehr conveyor with an eye to even distribution.

When shoulder labels are applied, a small second screen is mounted in a tilted position parallel with the main label screen. The speed of the Solar machine is determined by the speed of the operator; a good operator will handle up to 50 bottles per minute.

From the first decorating machine, a steel mesh conveyor takes the bottle through a small gas-fired drier to dry the color sufficiently for the second application. The bottle is subjected to a temperature of about 500 deg. F. for 110 seconds. At present Laurens Glass is experimenting with a Brown instrument on one of the driers. With this device, the heat of the drier is controlled thermostatically so that the heat can be turned off at any time that the conveyor line stops to prevent breakage due to overheating of the bottles.

From the drier, the bottles pass through two short tunnels where air blasts cool the ware to a point where it can be handled by the next operator.

The second and third colors are applied in exactly the same way as the first, except that care must be taken to obtain an exact register of the overlaying colors.

Amazing accuracy of register is obtained by the skilled

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THE GLASS DIVISION AT GALEN HALL

Doctor Galen was a Greek physician, born in Asia Minor about 130 A.D. He studied under Pelops in Smyrna, and became a renowned doctor and a modernist in medicine, the founder of experimental physiology. He migrated to Rome, where he became physician to the Emperor Commodus and other notables. He wrote 98 surviving treatises on medicine. Dr. Galen did not play golf, and he never saw the misty Alleghenies of Pennsylvania on a September morn. Otherwise, his seventy years of life were happy and useful, in spite of the low durability of his prescription bottles.

Galen Hall once a sanitarium, is a resort hotel in a beautiful setting. There the Glass Division held its nineteenth Autumn Meeting, September 5 and 6, at which 158 men registered. Program and arrangements were ably handled by Howard R. Lillie, of Corning Glass Works, vice chairman. Chairman Ralph F. Brenner, of Anchor Hocking Corporation, presided. The American Ceramic Society was well represented by John D. Sullivan, President; Charles S. Pearce, General Secretary, and L. E. Ohrstedt, Advertising Manager.

William W. Colbert receiving the Frank Forrest Award from Aaron K. Lyle, Trustee of the Glass Division.

At the business meeting on Friday morning, the main events of the program were announced: the group luncheon that day, a round-table on glass-to-metal seals, papers in the afternoon, banquet at 6:30, an entertainment put on by the hotel people at 10:30, papers on Saturday morning, and golf in the afternoon. All of these sessions were well attended, especially the American-plan meals, at which some cases of near-foundering occurred.

Harry Holscher gave a progress report for his definitions committee, which had put in a busy day on Thursday at the hotel. The completed glossary of glass terms cannot be expected until 1948. A. Pavlish reported on membership. The Division has 539 of the 3,259 members of the Society. J. Earl Frazier, by letter, announced for the exhibitions committee that no Glass Exhibit as such would be made at the Chicago meeting next April, but that the glass people would support the exhibit of the Materials and Equipment Division.

Sam Scholes reported on the balloting on new regulations for program committee and for the presentation of papers. All the proposals carried, although the one requiring typescripts of papers would be very difficult to establish. Discussion brought out, further, that new instructions from the Society office to authors of papers may make specific rules unnecessary.

Howard Lillie brought up the interesting matter of a proposed English translation of *Glastechnische Berichte*. A lively discussion followed, and the Chairman was authorized to put the matter in the hands of a committee to report in April.

Ken Lyon called attention to the recent death of Cullen W. Parmelee, and a committee, consisting of Lyon, Tooley, and Scholes, was named to write a commemorating resolution. The Division stood in silence for a half-minute.

Some time was given to discussion of the general improvement of meetings. It was concluded that ethics and manners be legislated, and that entering or leaving the room while papers are being presented is not intentional rudeness, however disturbing.

After dinner, President Sullivan and Secretary Pearce rose for brief remarks, to give greetings from the parent Society and to announce the annual meeting at the Palmer House, Chicago, April, 1948.

The first presentation of the Frank Forrest award was made by trustee A. K. Lyle. This award, given by the Preston Laboratories in memory of a young technologist who lost his life in World War II, is presented for the most meritorious paper on glass published during the preceding calendar year, and is made each year if the jury considers that a sufficiently worthy paper has been

Photos by Hettinger

F. W. Preston leads an informal discussion.

V. V. Kelsey assisting Ernie Hommel in family control.

presented. A scroll and a money prize of $100 accompanies the award. The first winner was William W. Colbert, for his paper on *The Influence of Titania and Lead Oxide on the Color of Glasses.* Mr. Colbert, a native of Danzig, who has lived in America less than ten years, and made a suitable speech of acceptance and thanks.

The resolution commemorating the passing of Cullen W. Parmelee was read by K. C. Lyon. It emphasized the generosity, patience and helpfulness of this man, whose many achievements and publications are well known to all who are acquainted with Glass Technology.

W. S. Moorshead of Manchester, England.

The two half-day sessions of technical papers brought an excellent variety. These papers will be abstracted elsewhere, but a few general remarks may be in order. Mr. G. D. Mylchreest reported ingenious methods of brutalizing bottles before pressing with a steel ball, until the poor things broke. Actual service tests of glassware in restaurant use, described by J. T. Glathart, brought out the fact that tumblers survived better in the Y.W.C.A. cafeteria than they did in the Y.M.C.A. cafeteria, where so many were lost that the test was inconclusive. E. L. Hettinger did not have his sawed-off air gun with him for testing goggle lenses, but he showed some interesting tricks that can be done with "hard glass" (incorrectly so-called) such as drilling holes in it without causing fracture. G. S. Bachman displayed a set of transmission curves of glasses modified by ten different oxides in small amounts, but his conclusions did not find general support in his audience.

Some of the most modern refractories for the retention of glass were described by A. P. Thompson. The blocks are certainly far different from the fireclay sort that were the only ones available when this Division began its activities. The photosensitive glass developed at Corning was effectively exhibited by S. D. Stookey. The idea of having a photograph that can be washed or even ground and polished if its surface gets out of shape is an exciting one. L. A. Shusset demonstrated the refinement of the physics laboratory experiment in which focussing on the near and far surfaces of a piece of flat glass permits the thickness to be read off on the barrel of the microscope. The method of determining heats of reaction between basic and acidic oxides in the glass melting process, brought out by the Bureau of Standards, is one that should be taken up by other experimenters and applied to a number of oxides.

J. S. McMullen and A. P. Thompson.

On the whole, the authors of papers showed that they had given some attention to the demands that are developing; they avoided reading from manuscript; they showed very few slides that were overcrowded with data in small figures; they showed graphs wherever possible; they made effective use of the public address system.

Golf was played on the beautiful nine-hole course adjacent to the hotel. As one player said, "The course is short, but don't let it fool you." W. H. Ellis, of R. T. Vanderbilt Company, managed the tournament, and succeeded in having so many prizes donated from various materials companies that he had some difficulty in getting enough competitors for their distribution. He arranged all sorts of contests, ranging from the usual low gross and low net, through a kickers' handicap, to competition for the most threes, the fewest puts, the most sixes, the most eights and the highest score on any hole. We shall mention only a few of the winners. K. M. Henry took home a portable radio and the O. Hommel trophy for low gross. Hobie Kraner won low net. R. L. Newton took the fewest puts, and a man who refuses to have his name mentioned received a pair of sun glasses for the highest score on any one hole.

Summaries of papers follow:

Carl Hertzig, R. R. Shively and H. H. Holscher enjoy the hills surrounding Galen Hall.

Tom Willson, Jr., Armand Houze, Jr. and Bill Board cool off between sessions.

Effect of Abrasion and Other Influences on Glass Surface Strength. *By D. W. Mueller and G. D. Mylchreest, Hartford-Empire Company, Hartford, Conn.*

A procedure has been devised for measuring the surface strength of glass at any selected point on the interior or exterior surfaces of a bottle wall. Selection of the point of failure in advance has the following advantages: it reduces the area which must be treated in the selected test manner and it minimizes the risk that failure may occur at some gross flaw elsewhere in the bottle.

The test consists in pressing a steel ball against a point on the cylindrical portion of a bottle wall with increasing measured load until failure occurs. In the present work, a rate of loading of 26.7 lbs. per second was used. A formula developed by R. J. Roark was used to compute the unit breaking stress.

Tests were made on both the inside and outside surfaces of "virgin packed" (bottles taken directly from lehr and placed in partitioned cartons without rolling during the inspection) and bottles which had been given various surface treatments. The results obtained are given in the following table:

STRENGTHS OF BOTTLE SURFACES

Surface	Treatment	Strength lbs./sq.in.
Inside	From carton	168,500
Inside	Lens tissue	169,300
Inside	Water 14 days	143,300
Inside	Annealed twice	123,700
Inside	Toilet tissue	99,800
Outside	Virgin lehr—warm	82,200
Outside	Virgin lehr—steel wool	73,500
Outside	Virgin lehr—cellulose coat	64,100
Inside	Steel wool	57,000
Outside	Virgin lehr—cold	55,500
Outside	From carton	33,700
Outside	Annealed twice	32,600
Outside	Steel wool	29,800
Outside	Tumbled on lehr belt	17,500
Outside	Bottle rubbed on bottle	13,230
Outside	1 lb. scratch	9,400
Inside	1 lb. scratch	6,300

It is believed to be well established that rupture started in the immediate vicinity of the point of application of the load in these tests. This opinion is supported by both flash photographs and diagnosis of the fracture patterns. The question as to whether the origin occurred at the boundary of the area of contact between ball and glass or at the opposite surface of the glass at a point opposite the center of the loaded area is answered by the fact that the indicated strength generally varied substantially and consistently with treatment of a given surface when loading was on the opposite surface and supports the view that failure occurred at the surface opposite the ball for the most part. However, the highest strengths obtained for inside surfaces should be considered minimum values for, as far as these tests indicate, failure may have commenced at the outside at the loads corresponding to the reported high stresses. This uncertainty exists only in the highest values.

Service Life of Glassware. *By J. L. Glathart and F. W. Preston, Preston Laboratories, Butler, Pa.*

THE GLASS INDUSTRY describes itself as the Journal of Glass Manufacturing, and most papers in glass technology have tended to concern themselves with some aspect or other of manufacturing. The present paper takes up the story after the manufacturer is through with his product: what happens to it in the hands of the user? Something is known of this in a general way, but the necessary groundwork seems never to have been laid in a quantitative fashion. "Installations" of tumblers were studied as being more accessible and controllable than bottles or most other forms of glassware.

The paper discusses the Mortality Curve, which shows the relative proportions of tumblers that perish at each age: the Survivors' Curve, which gives the age-distribution of tumblers in a "mature" population: the Vulnerability (or Mortality) Curve, which indicates the relative rate at which tumblers of different ages would perish if, at a particular time, all ages had equal representation in the population: the Impact Strength (measured in the laboratory) as a function of age, showing that this curve is the inverse, or reciprocal, of the Vulnerability Curve as determined in the field: Merrill Flood's Theorem, which leads to a method of evaluating the merits of two (or more) sorts of tumblers with a minimum of work, but a considerable delay; Conrad Stone's hypothesis, which states that if expressed in completely non-dimensional form, all installations behave in an identical fashion, which leads to a method of assessing the final behavior of an installation by means of meticulously kept data from the very early stages of the experiment: and the "Short Cut," which by an extension of Stone's hypothesis permits the prognostication at an early stage without keeping detailed records of the early stages.

It is shown that the changing vulnerability with age is a vital factor in all these matters: that it increases rapidly at first, but "saturates" or reaches a constant value later: that it is caused by rubbing or abrasion of critical areas or zones of the glassware: that it may be, and often is, of totally different origin from the impact injuries, though impact is what finally destroys the ware; and that whether it is physically different or not, it may be treated mathematically as a separate factor, thereby leading to a clearer understanding of the service life performance.

The Spectral Transmission of Glasses. *By George S. Bachman, University of Illinois, Urbana, Illinois, now with Pittsburgh Plate Glass Company.*

In the first part of this paper, the author presented a series of slides showing the ultraviolet, visible and infrared transmission curves for various glasses. The base glass was a soda-lime-silica type to which had been added various concentrations (at least three levels) of V, Cr, Cu, Fe, Co, Ni, Ne, Pr, Sm and U.

The curves presented confirmed in general the work of other investigators in this field. The ultraviolet cut-off, the bands in the visible region and the water band and silicon band were pointed out for each added oxide.

In the second part of this paper, the author presented data obtained from a study of the infrared absorption curves obtained from a series of feldspar crystals and a series of feldspar glasses resulting from the melting down of the feldspar crystals. The comparison indicated that some of the glasses obtained from the melting down of the crystalline phase carry over a regular structure instead of a random-network structure.

Developments in High Alumina Fused Refractories. *By J. C. McMullen and A. P. Thompson, Mellon Institute, Pittsburgh, Pa., for the Carborundum Company.*

Consideration of the flux block problem as encountered in the glass industry shows that there are two complementary viewpoints from which it must be approached, viz., a) the attack on the refractory by the raw batch and the molten glass and b) the contamination of the glass by such attack through seeds, stones and striae. If the bond is weak and is rapidly attacked, both a) and b) will be accelerated. In the case of the superstructure, the additional important requisites for a refractory are resistance to high temperatures and to moderate temperate changes (high spalling resistance). The development of fused cast refractories with high spalling resistance is one answer to the glass industry's refractory problems and this present paper deals with the manufacture and properties of several Monofrax mixes which are being used in the glass industry.

Three Monofrax mixes are now being used commercially in glass tanks. They are identified by the letters H, MH and K. An important property common to all three mixes is their ability to carry heavy loads at elevated temperatures. Using the A.S.T.M. Standard load test, there is no measurable deformation at 1500°C. (2732°F.).

In the case of Monofrax H, this mix is highly crystalline, being almost entirely composed of beta-alumina. Its melting point is about 1950°C. (3542°F.). It is distinguished

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THE MICRO-ANALYSIS OF GASES IN GLASS

Several procedures have been proposed during the past several years for the quantitative determination of the gases that are present in the bubbles which may be present in glass. In the April, 1944, issue of *The Analyst*, W. B. Price and L. Woods published a paper on "A Rapid Method of Micro Gas Analysis," which deals with a procedure that is particularly suited to the examination of such gases. As the details are of interest to all technologists, the original article is summarized below:

The method originated with a biochemist, Krogh,[1] who wished to examine the gases dissolved in blood. It was then developed and applied to the examination of the gases in bubbles in glass by Enss.[2] It consists in isolating the bubble of gas, confining it in glycerin, and measuring the diameter by means of a microscope. The bubble is then surrounded with a series of liquid reagents in turn of the type used in the macro-analysis of inorganic gases. After each treatment it is returned to glycerin, and its diameter is re-measured. A decrease after treatment with any reagent is taken to indicate the presence of the corresponding gas, and the amount of such decrease to represent the quantity present. Thus, assuming the bubble to be spherical, the original volume

$$v_1 = \frac{\pi D_1^3}{6} \text{ and the final vol. } v_2 = \frac{\pi D_2^3}{6};$$

the percentage decrease then

$$= \frac{v_1 - v_2}{v_1} \times 100 = \frac{D_1^3 - D_2^3}{D_1^3} \times 100 \text{ or } 100\left(1 - \left[\frac{D_2}{D_1}\right]^3\right)$$

This procedure has a number of advantages and also some disadvantages. The advantages are, briefly, compartive simplicity of apparatus, speed, and ability to deal with quite small vols. of gas. Of the apparatus needed, a microscope fitted with a mechanical stage, and having an eye-piece scale, is the most expensive. The remainder consists largely of glass pipettes of special shape, which are easily made, glass capillary tubes provided with taps, and metal boxes to hold the glycerin. Dissecting needles, tweezers, and a good hand magnifying glass are also necessary. There have also been developed two pieces of apparatus specially for controlling the piercing of bubbles in glass, one being for use in conjunction with the microscope. They are used when it is desired to allow a liquid reagent to flow into a bubble in a piece of glass and to observe the effect, either at the moment of piercing or at leisure afterwards.

It has been found that about 1 hr. is sufficient for a full analysis which includes the determination of hydrogen sulphide, carbon dioxide, oxygen, carbon monoxide and hydrogen. If the greater part of the mixture consists of one of the first two or three gases to be tested for, it is often possible to stop at that point, with a consequent shortening of the time. This obviously depends on the amount of information required about the minor constituents of the mixture.

The minimum volume of gas which can be comfortably dealt with is that contained in a bubble whose diameter is about 0.2 mm, i.e., about 0.004 cb.mm. Much, of course, depends on the actual composition of the gaseous mixture, since if there is, e.g., ca. 90 per cent of hydrogen sulphide in a gas bubble of 0.2 mm diam., the bubble will shrink after treatment with the first reagent to so small a size as to render further manipulation impossible. With such mixtures, however, the composition of the residue is often of little importance.

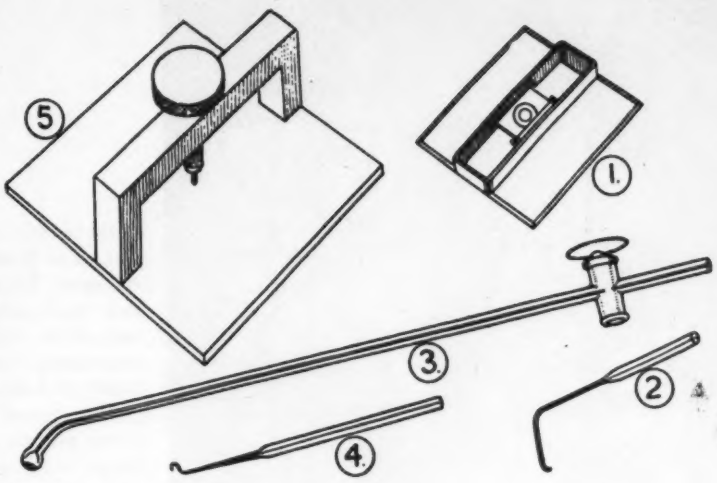
Method—Grind the surface of the glass nearest to the bubble by means of an abrasive, such as carborundum, until about 1/1000″ separates it from the interior of the bubble. Then immerse the glass in the glycerin contained in one of the metal boxes or troughs mentioned above (Fig. 1). It is convenient to have a number of these boxes at hand; suitable internal dimensions are 3″ long ¾″ wide, and ½″ deep, and the material may be brass or copper sheet. Each box is provided with a central circular window in the bottom, which may be ½″ in diameter, and two narrow brackets in the center of each long side near the top to hold a shortened microscope slide, which must be directly over the window. The bubbles are more easily followed by eye if the interior of the box is painted black. Pour glycerin into the box until it makes contact with the underside of the microscope slide, taking care to avoid introduction of air bubbles. A cover should be provided to exclude atmospheric moisture when the box is not actually being used, since the highly hygroscopic nature of the glycerin causes rapid absorption of any moisture that is available and subsequent measurements of bubble diameter are made difficult or impossible by the resulting striae.

During the introduction of the glass into the glycerin take care once more to avoid the carrying in of air bubbles. Push the glass under the piece of microscope slide, pierce the carrying wall with a sharp point and remove the gas bubble from the cavity by means of a bent dissecting needle, allowing it to rise through the glycerin until it comes to rest under the slide. Next measure the diameter; it is sufficient to know it in terms of scale divisions, since only the relative decreases are needed. Remove the bubble by sucking it into a bent capillary pipette (Fig. 2) which has previously been partly filled with glycerin. The internal diameter of the pipette should not be appreciably smaller than that of the bubble; about 0.5 mm has been found to be generally suitable. Transfer the bubble to a solution of cadmium acetate in glycerin, contained in a small basin. Immersed in the solution is a piece of glass tube, ca. 1 cm in diam. and 1½-2 cm. long, lying on its side; introduce the bubble into this through one of the open ends. Roll the tube over so that the bubble is carried down, and then allow it to rise, passing through fresh reagent as it does so; repeat the operation as often as desired. After an immersion of 5 min. remove the bubble by means of the pipette (the outside of which has first been wiped) and transfer it first to a glycerin wash trough and allow it to rise through clean glycerin several times to remove cadmium acetate solution, and then to the original trough, and again measure its diameter. The decrease is taken to represent hydrogen sulphide. Repeat the whole procedure, using a solution

1. Krogh, A., *Skand. Arch. Physiol.*, 1908, *20*, 279; Feigl, F., *"Qualitative Analysis by Spot Tests,"* English trans., 1937, p. 184.
2. Enss, J., *Sprechsaal*, 1933, *66*, 662.

of caustic potash in glycerin, for the determination of carbon dioxide.

The remaining reagents are aqueous solutions, and, as the low viscosity of water compared with that of glycerin causes difficulty in the control of the bubble, a different form of apparatus has been devised (Fig. 3). This, consisting essentially of a piece of capillary tubing, about 30 cm long and 1.5 mm in internal diam., has the advantages, first that the bubble can be caused to move along the length, and so comes continuously into contact with fresh reagent; secondly, that the exposure of the reagent itself to the atmosphere is reduced to a minimum, thereby practically preventing the absorption of atmospheric oxygen by two of the reagents (sodium hydrosulphite and cuprous chloride); thirdly, that the reagent does not become contaminated with glycerin.



Figures 1—5

The capillary tube is provided with a tap 5 cm from one end. At the other end a small bulb, about 5 mm in internal diam., is blown with an opening, about 3 mm across, opposite the capillary. Through this opening the bubble is introduced and removed. About 3 cm from this bulb the capillary tube is bent through an angle of about 15 degrees. The tube is supported on a small stand; its normal position is horizontal, but provision is made to turn it almost vertically in either direction. These tubes, of which several are needed, must be kept perfectly clean to prevent the bubbles from adhering, and it is desirable to keep them in chromic acid cleaning solution when not in use.

For use, the tube is filled with reagent by means of a rubber teat, great care being taken to avoid the entry of air bubbles. The meniscus at the bulb end should lie across the opening in the bulb; when the tap is closed and the tube held vertically so that the open end hangs downwards, no liquid runs out. Before the bubble is introduced the tube is arranged horizontally, with the bend at the bulb end pointing downwards. The bubble is introduced from the pipette, and the tube is then tilted so that it travels up the tube almost up to the tap. It is then brought back and removed by means of a pipette of a slightly different shape (Fig. 4). Usually one passage through the reagent suffices. Some practice is needed at first in introducing and removing the bubble, but the necessary skill is easily acquired, and failures thereafter are rare. Separate tubes are used for each of the three aqueous reagents, and the washing and measuring already described are repeated after treatment in each of them. These reagents, for oxygen, carbon monoxide and hydrogen, are respectively alkaline sodium hydrosulphite solution (which does not discolor), ammoniacal cuprous chloride solution, and colloidal palladium solution containing sodium picrate. The last of these is rather more difficult to use than the others, since it is black and opaque, and considerable care is needed in watching the bubble during treatment. The residue after the final operation is assumed to be nitrogen.

Tests for Sulphur Dioxide, Hydrogen Sulphide and Water Vapor in Bubbles in Glass

Qualitative tests have been developed for these substances in bubbles in glass. For the first two of them a simple pricker is sufficient (Fig. 5). This consists of a base plate, about 6″ square, carrying two pillars and a cross bar. Through the center of the latter there acts a vertical screw carrying a sharp steel point at its lower end. It is only necessary to place the glass containing the bubble, prepared as already described, under the point and to screw the latter down, to effect a controlled piercing of the bubble. In use, for the test for sulphur dioxide, after the glass is in position, with the steel point touching the glass over the bubble, a drop of Steigmann's reagent[3] is placed round the point. Since the gas in almost all bubbles in glass is under reduced pressure, the reagent is sucked in as soon as the wall has been pierced. In presence of sulphur dioxide a reddish-purple color is developed on standing.

For hydrogen sulphide tests the conditions are slightly modified. The sharp point is replaced by a blunt rounded one, and a small piece of filter-paper, wet with mercuric chloride soln., is interposed between it and the surface of the glass. The screw is turned only so far as to crack the glass, without piercing the paper. In this way the filter paper is exposed to the action of the gases in the cavity. It is removed and washed, and is then treated with a drop of sodium azide-iodine solution,[4] and observed under the microscope. An evolution of bubbles from that part of the paper previously in contact with the gases indicates the presence among the latter of hydrogen sulphide.

The test for water vapor is less certain, but can be useful on occasion. Use is made of Karl Fischer's reagent,[5] and a more elaborate form of pricker is used. This is similar in construction to a microscope mechanical stage and is used mounted on a microscope, the tube of which is set horizontally. Its purpose is to allow of microscopical inspection of the bubble at the moment when the reagent enters the cavity and immediately afterwards. The reagent is so sensitive to atmospheric moisture that it is essential to observe its behavior in this way. A uniform

(*Continued on page* 538)

3. Steigmann, A., *J. Soc. Chem. Ind.*, 1942, *61*, 18.
4. Feigl, F., *Z. anal. Chem.*, 1928, *74*, 369.
5. Fischer, K., *Angewandte Chem.*, 1935, *48*, 394.

BATTLE OF BRI MO

By order of the King, this Chapel in Westminster Abbey was set apart for all time in dedication to the memory of some 1500 men of the Royal Air Force who gave their lives in the decisive Battle of Britain in 1940.

The special altar and stained glass window were unveiled by King George on July 10, 1947, in the presence of the Queen, Queen Mary, Princess Elizabeth, Princess Margaret and other members of the Royal Family. This date marked the seventh anniversary of the first day of the famous battle.

The memorial window, part of a four hundred year old chapel in

RI MORIAL CHAPEL

a secluded corner of Westminster Abbey, is a brilliant jeweled array of forty-eight "lights," each of which tells the story of the battle in symbolical pictures and portrays its own meaning. This window, which is the principal part of the Memorial, is the work of Hugh Easton, whose aim it was to create in glass a jeweled curtain giving the effect of a translucent painting—a fresco seemingly shot through by flames. In four panels of the window are shown Visions which symbolize the Redemption. The window is at the easternmost end of Henry VII's Chapel.

INVENTIONS AND INVENTORS

A Summary of Recently Issued Patents of Interest to the Glass Industry

Glass Compositions

Ceramic Composition for Making "Glass-like" Articles. Patent No. 2,426,395. This composition is the invention of Kelsey I. Harvey of Beaver, Pa. It discloses a vitrified ceramic composition which may be used to produce glass-like articles, a bond or a glaze or other similar products. The product is said to be very tough and hard and inexpensive.

This composition is preferably made of compounds containing boron, lead and lithium. The boron and lead are preferably in a compound of their oxide form such as borax, boric acid, and litharge red or white lead oxide and the lithium as lepidolite, although other sources may be used. To obtain the best results, no clay should be used. The resulting material has a low coefficient of expansion, it will withstand high temperatures and thermal shocks and does not require annealing or slow cooling.

By adding a sufficient amount of silica, this ceramic may be converted into a glass. The addition of 45 per cent or more of silica produces a glass different from any heretofore known but which resembles well known borax glasses which do not contain lithia. This glass is less brittle than the usual borax glass.

Claim 1 calls for a composition of the following parts, measured by weight:

33⅓ parts boric acid;
33⅓ parts litharge;
9 parts lithium nitrate.

An unusually large number of patents were cited by the Patent Office during the prosecution of this application, as follows: United States Patents: 1,261,015, Enequist, Apr. 2, 1918; 1,443,813, D'Adrian, Jan. 30, 1923; 1,626,042, Locke, Apr. 26, 1927; 1,927,737, Eisenlohr, Sept. 19, 1933; 2,007,349, Schertel, July 9, 1935; 2,020,559, Malinovszky et al., Nov. 12, 1935; 1,583,901, Schurecht, May 11, 1926; 1,583,902, Schurecht, May 11, 1926; 1,708,743, Skaupy et al., Apr. 9, 1929; 2,207,723, Deyrup, July 16, 1940; 2,225,162, Deyrup, Dec. 17, 1940; 2,255,044, Deyrup, Sept. 9, 1941; 2,225,160, Deyrup, Dec. 17, 1940; 2,247,331, Ferguson, June 24, 1941; 1,765,287, Scott, June 17, 1930; 1,449,793, Taylor, Mar. 27, 1923; 1,652,259, Taylor, Dec. 13, 1927; 1,615,247, Taylor, Jan. 25, 1927; Re. 13,766, Macbeth, July 7, 1914; 1,097,600, Macbeth, May 19, 1914; 1,143,788, Schnelbach, June 22, 1915; 1,327,569, Teregrine, Jan. 6, 1920; 1,529,259, Locke et al., Mar. 10, 1925; 1,721,979, Taylor, July 23, 1929; 1,271,652, Bellamy, July 9, 1918; 1,508,455, Kraus, Sept. 16, 1944; 1,513,923, Montgomery, Nov. 4, 1924; 1,864,858, Rising, June 28, 1932; 1,192,474, Taylor, July 25, 1916; 1,233,486, Locke, July 17, 1917; 1,737,685, Rising, Dec. 3, 1929; 1,754,065, Taylor, Apr. 8, 1930; 1,754,182, Taylor, Apr. 8, 1930; 1,815,812, Taylor, July 21, 1931; 1,394,296, Fisher, Oct. 18, 1921; and 1,623,301, Brenner, Apr. 5, 1927. Foreign Patents: 223,837, Great Britain, 1924; 223,295, Great Britain, 1925; 200,020, Great Britain, 1923; 3,007, Great Britain, 1874; 707, Great Britain, 1755; 4,139, Great Britain, 1881; 11,016, Great Britain, 1888; 16,165, Great Britain, 1906; 601,470, France, 1925; 753,908, France, 1933; and 388,118, Great Britain, 1933. Other References: Scientific American, April, 12, 1890, p. 228.

Miscellaneous Processes

Bottle Inspection Apparatus. Fig. 1. Patent No. 2,426,355. This patent is directed to the inspection of the contents of bottles for the purpose of detecting any foreign matter therein. It would seem that any device which will detect foreign matter in the contents of a bottle would also detect foreign matter in the bottle itself, such as seeds, stones and chipped surfaces. This is the invention of Edward W. Kellogg of Indianapolis, Ind., who assigned it to Radio Corporation of America.

A beam of light passes through the bottle and illuminates photoelectric cells. The current from these cells is amplified to the necessary degree and operates a relay which passes or rejects the bottle. The bottles are deposited on a continuously revolving turret and the optical system is mounted to oscillate about the center of the turret, following each bottle for a short distance and then returning quickly to pick up the next bottle. The central arm carries five lenses, while there are ten photocells to receive the light, outside the path of travel of the bottles.

As shown in Fig 1, the bottles 10 are received from a conveyor 12 through a star wheel 14 onto a turret 16. As they travel around the turret, they are inspected and then pass out on a conveyor 20 if they are OK or out on a conveyor 22 if any foreign matter is detected. The lamp is shown at 24 and a series of lenses 32 direct the light to a rocking mirror 28. The lenses 32 are arranged to provide different illumination for different parts of the bottle. Means are provided so that the direction of the beam of light does not change with reference to the bottle during the inspection period. Lenses 34 and 36 provide for this.

In order to reduce vibration as much as possible, two banks of cells 38 are placed as near as possible to the center A of the machine. Light is transmitted to the cells through "Lucite" rods 40 which are rectangular in sec-

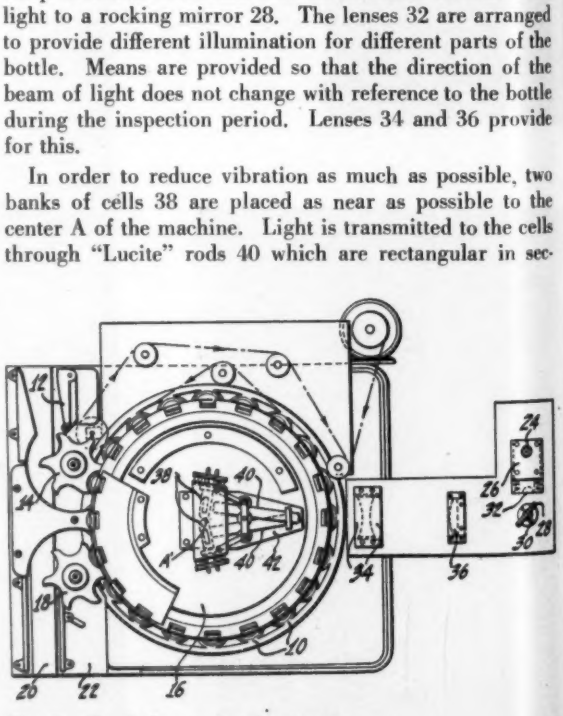


Fig. 1. Bottle Inspection Apparatus.

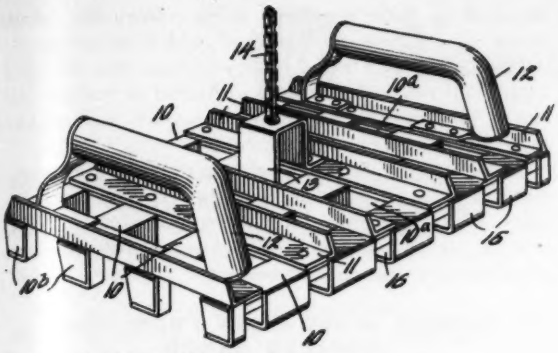


Fig. 2. **Bottle Handling Mechanism.**

tion and ten, corresponding to the ten photocells, are stacked so as to cover the entire height of the bottle. This mechanism is mounted on a base 42 which oscillates so as to follow each bottle as it passes. The optical system is described in detail in the patent and many safeguards are provided to prevent false indications. Reference is made to a co-pending patent to James H. Reynolds filed September 27, 1944, for some device useful in the inspection of bottles. This Kellogg patent has inspected bottles at over 165 per minute which is a great improvement over the prior machines.

The following references are of record in the file of this patent: United States Patents: 2,132,447, Stout, Oct. 11, 1938; 1,925,814, Nicolson, Sept. 5, 1933; and 2,124,802, Wallace, July 26, 1938.

Method of Washing Milk Bottles. Patent No. 2,425,907. While the washing of glass ware is not involved in the manufacture of the ware, it is of great interest to the manufacturer as he is often blamed for damage caused by repeated washing. Caustic alkali, e.g. sodium hydroxide, is the major ingredient of most alkali washing solutions and this is what causes the glass dissolving action in the course of repeated washings. The method of this patent greatly reduces this attack on the surface of the glass. It was assigned to Wyandotte Chemicals Corporation by Walter F. Wegst, Leslie R. Bacon, Thomas H. Vaughn and Duncan J. Crawford. While this method can be used in washing any kind of glass or enamel, it is of particular importance with milk bottles.

One example of the washing operation with a soaker type machine might be as follows:

Pre-rinse with warm water;
Soak at 140° F. in alkaline solution of 3.0-3.5 per cent caustic soda content;
Soak at 155° F. in alkaline solution of 2.5-3.0 per cent caustic soda content;
Water rinse at lower temperature, as 125° F.;
Water rinse at lower temperature, as 95° F.;
Internal and external brushing;
One or more internal and external cool water rinses;
Internal chlorination rinse.

Of course, this cycle is subject to considerable variation. Both temperature and alkaline content effect the damage to the surface of the glass. A washing such as this would usually take as long as five minutes.

The following table gives the result of a test run on bottles of 6 ounce capacity and weighing 393 grams. The bottles were filled with a water-caustic alkali solution and held for six days at 185 degrees F.

Total Solids in Soln. (by weight)		Loss of Weight (in milligrams) at Per Cent Concentration[1]		
NaOH	Sodium Stannate, i.e. $Na_2SnO_3.3H_2O$	1%	3%	5%
100	0	749	1,180	1,471
95	5	582	616	766
90	10	507	748	911
80	20	295	532	641

Under similar conditions 6 per cent of sodium hydroxide was added, when the results were as follows:

Inhibitor	Periodic Classification		Weight of Inhibitor (in grams)	Loss in Weight of Bottles (in milligrams)	Initial Condition of Solution
	Group	Series			
Strontium Chloride ($SrCl_2.6H_2O$)	II-A	6	0.554	171	Ppt.
Strontium Sulfide (SrS)	II-A	6	0.246	92	Ppt.
Barium Chloride ($BaCl_2.2H_2O$)	II-A	8	0.276	177	No ppt.
Bismuth Trichloride ($BiCl_3$)	V-B	11	0.274	975	No ppt.
Antimony Trichloride ($SbCl_3$)	V-B	7	0.340	896	No ppt.
Stannous Chloride ($SnCl_2.2H_2O$)	IV-B	7	0.346	618	No ppt.
Stannic Chloride ($SnCl_4$)	IV-B	7	0.398	722	No ppt.

The gist of this patent seems to be in the use in an alkaline washing compound having an NaOH content of 1-10 per cent. If this invention works out as expected, it should be of considerable interest to glass manufacturers.

The following references are of record in the file of this patent: United States Patents: 2,241,984, Cooper, May 13, 1941; 2,303,397, Schwartz, Dec. 1, 1942; 2,303,399, Schwartz, Dec. 1, 1942; and 2,380,284, Young, July 10, 1945. Other References: Chemical Formulary—Bennett: vol. 4 (1939), page 507.

Bottle Handling Mechanism. Fig. 2. Patent No. 2,426,356. This patent was assigned to The Coca-Cola Company by Eugene Kelly of Toronto, Canada. It shows a hand operated device for picking 24 bottles from a case so that they may be deposited where wanted, such as in a washing machine.

As shown in Fig. 2, the device comprises a plate 10 having a series of stiffening members 11. Handles 12 are provided for the operator. A counterbalance to carry part of the weight is connected to a chain 14. The bottles are engaged by L-shaped projections 15, 16. Flanges 10b are provided to prevent the apparatus from catching the operator's clothing or anything else. Each of the parts 16 is provided with a notch wide enough to engage the neck of the bottle below the finish. After engaging the necks of the bottles in the case, the device is lifted and swung to the place where the bottles are to be deposited where they are disengaged by a lateral movement after they are at rest on a support.

The following references are of record in the file of this patent: United States Patents: 2,264,903, Kruea, Dec. 2, 1941; 2,276,756, Agrillo, Mar. 17, 1942; and 2,310,594, Yoigtritter, Nov. 10, 1942.

Glass Headers for Electron Tubes. Fig. 3. Patent No. 2,426,990. This is an invention of Bennett S. Ellefson of Emporium, Pa., who assigned it to Sylvania Electric Products Inc. The object of the invention is to make disc and cup-shaped glass headers having a number of

(*Continued on page* 542)

HAROLD BOECHENSTEIN MAKES STATEMENT ON ANTI-TRUST ACTION

Harold Boechenstein, president of Owens-Corning Fiberglas Corporation, today described as "baseless" the anti-trust action charging monopoly filed against the company in Federal District Court here Sept. 10.

"In our nine years in business as a company," Mr. Boechenstein said, "We have made no important move without preliminary discussion with government authorities.

"We discontinued all foreign contracts seven years ago, and so informed the government.

"For more than a year we have made our patents available to everyone, offering licenses to anyone in this country who wished to manufacture fibrous glass and our patents were officially listed October 1, 1946, in the Federal Register of Patents as available for licensing."

Mr. Boechenstein pointed out that the company had expanded its facilities to develop and produce materials of "great strategic value" at the behest of the Army and Navy during the War, and since the War was trying in highly competitive fields to find applications for those materials in peacetime products. He expressed the belief that the government should encourage rather than hamper these efforts.

His statement read: "Anti-trust charges brought by the Government against Owens-Corning Fiberglas Corporation are baseless. We are at a loss to understand the reasoning of the Government in filing anti-trust proceedings against our company.

"Historically ours is a new company, formed only nine years ago. Every important step in its formation was taken only after discussion with the Government. Much of our rapid growth came during the war, with the Government as a partner.

"The charges are based on alleged patent monopoly and alleged restrictive agreements with various foreign corporations engaged in similar production.

"More than seven years ago we abandoned our foreign connections. For more than a year we have offered to grant licenses to any one interested in the manufacture of fibrous glass in this country, and our patents were officially listed October 1, 1946 in the Federal Register of Patents as available for licensing. No mention of these actions was made in the complaint, although the Government was fully familiar with them.

"Arrangements preceding formation of the company were discussed with the Government as long ago as 1938. We are therefore at a loss to understand the action of the government at this time.

"Our products were of strategic value to our armed forces during the war, and were so appraised by the army and the navy. Since the war, our company has been struggling to create peacetime markets for our materials. We had hoped that the government would encourage rather than hamper our efforts.

"Any question of our competitive position should be answered by the fact that our new materials are in competition with rayon, cotton, nylon, wool and jute among the textiles, and with asbestos, rock wool, wood products, magnesia, paper and other materials in the insulation field. We are trying to find a place in the home-building field. In combination with plastics our materials are in competition with the light metals. In every instance we meet competitors who have long been entrenched in their respective fields. Our efforts have tended to diminish shortages and hold down prices.

"We agree with the Attorney-General that this is a 'significant new industry' and we intend to continue our efforts to make the materials we develop and produce increasingly useful and economical.

"We hope that we will be able to convince the government that the inference which it has drawn in its complaint is wholly unwarranted in the light of our policies, both as regards open licensing of our patents and freedom from any restrictive agreements."

KIMBLE GLASS SALES PROMOTION MANAGER NAMED

Harlan Hobbs, former Manager of the Owens-Illinois Film Division, has been appointed Sales Promotion Manager of the Kimble Glass Division of Owens-Illinois Glass Company.

The new Sales Promotion Division located in Toledo, Ohio, will include, in addition to the former Kimble Advertising Department, units for market research, merchandising, publicity and public relations. Kenneth E. Robb and R. W. M. Ritter will join Mr. Hobbs' staff. The new division will also handle sales promotion activities for the Glasco Products Company of Chicago, Illinois, a subsidiary of Owens-Illinois.

Mr. Hobbs joined Owens-Illinois Glass Company in 1943 and organized the company's Film Division, where he produced several documentary and educational films relating to the glass industry.

DR. SILVERMAN TO SPEAK BEFORE PITTSBURGH SECTION

The first Technical Meeting of the Pittsburgh Section of the American Ceramic Society for the 1947-48 season will be a discussion of glass on October 14 in the Mellon Institute.

Dr. Alexander Silverman, Professor of the University of Pittsburgh, will present the discussion of many types of glassware, including plate glass, pressed ware, fiber glass, optical glass, scientific glassware and art ware. He will use many colored slides as illustrations.

AMERICAN POTASH SIX-MONTH REPORT

American Potash & Chemical Corporation has reported net earnings of $1,102,056.88 for the six-month period ending June 30, 1947. This is equal to $1.94 per share on outstanding Class A and B common stock, after deducting $77,777.77 to cover dividends on the "Series A" preferred stock issued in March 1947.

Earnings for the comparable period last year were $723,969.74 or $1.37 per share on the Class A and B stock. Gross sales of company's products, which include potash, boron products, salt cake and soda ash, amounted to $10,332,328.77 for the first half of this year. Sales over the same period last year totaled $7,550,617.99.

Research Digest

Studies in the Distribution of Temperature Through Molten Glasses in a Tank Melting Furnace. Part III. The Effect of Glass Composition. Part IV. The Effect of Cobalt Oxide

In the first two parts of this investigation, it was established that the temperature distribution through the molten mass of glass was dependent on the nature and the concentration of the coloring oxides present. Since the colorless glass hitherto investigated has been one of soda-lime-silica composition, it was of importance practically, and of special interest scientifically, to examine how far the basic composition of other colorless glasses has an appreciable effect on the transmission of heat through them in the molten state.

Part III deals with this phase of the investigation (Allison, Halle and Turner, *Journal of the Society of Glass Technology*, December 1946). Four commercial colorless glasses were used; namely, a soda-lime-silica, an alkali-lead oxide-silica, Pyrex and an alumino-borosilicate glass of low alkali content. The laboratory tank-furnace and the experimental procedure used were the same as described in Parts I and II of this investigation.

From a summary of the data obtained, the following conclusions were drawn: 1) In the case of the gas consumption experiment, the respective gas consumptions required to produce the same surface temperature were very nearly the same for the four glasses.

Previous measurements had shown that for colored glasses the fuel required to maintain a constant surface temperature was less than for a colorless glass. Thus, to maintain a constant temperature of 1400°C. at the surface of the molten glass, the gas consumptions in cubic feet per minute were 12.0, 10.5 and 9.5, respectively, for a colorless, amber and dark green glass. The present results show that the gas consumption is practically constant for colorless glasses of widely different basic composition.

2) The vertical temperature gradients of the four colorless glasses agree closely over the whole range of surface temperature studied. They ranged from 5°C. to 10°C. per in. This may be compared with gradients of 85°C. per in. for the specially prepared glass containing 0.55 per cent iron oxide or, in the case of the commercial glasses previously studied, with gradients of 50°C. per in. for an amber, or 85°C. per in. for a dark green glass.

3) The calculated overall transmissions, based on temperature measurements of the molten glass and of the principal brick surfaces, show close agreement between the four glasses (See Table I), as compared with 49 per cent for an amber and 37 per cent for a dark green glass. The Pyrex glass, however, again shows a greater overall transmission than the three other colorless glasses as was to be expected from the results reported above.

TABLE I

CALCULATED OVERALL HEAT TRANSMISSION OF SOME COMMERCIAL COLORLESS GLASSES

No. of Glass	Type of Glass	% Overall Transmission	Heat Transmitted in B.T.U. per sq. ft. per in. depth per minute
1	Lead Crystal	59	71
2	Bottle	60	73
3	Pyrex	63	77
4	Mercury Vapor Lamps	59	68

4) Pyrex glass has a lower thermal absorption in the surface zone and a higher transmission of heat through the remainder of the mass of glass than do the three other colorless glasses. Moreover, this greater transmission occurred despite the fact that it had a higher total iron oxide content than the other glasses, although it contained the lowest proportion of ferrous oxide.

It is well known from the work of other investigators that fused quartz at room temperatures possesses a very high transmission for infrared radiation. Although there is no direct knowledge of the transmission of molten silica, it does appear likely that the presence of a higher silica content with high boric oxide bestows on a Pyrex type glass the higher transmission that was found.

In Part IV of this investigation, the effect of cobalt oxide on the temperature distribution of molten soda-lime-silica glass was studied in a laboratory scale tank furnace. To the parent glass of percentage composition SiO_2, 73.5; Al_2O_3, 1.0; CaO, 9.0; and Na_2O, 16,5, cobalt oxide was added in amounts varying from 0.0022 to 0.44 per cent, care being taken to maintain a constant concentration of iron oxide present in the glass as an impurity.

For the series of ten glasses obtained, the vertical temperature gradient at the center of the mass was obtained. Up to about 0.025 per cent cobalt oxide, a concentration bestowing a distinct coloration on the glass, the temperature gradients varied from 7° to 12°C. per inch depth, these values being considerably lower than those found in amber or green glasses and not much different than the colorless parent glass. Only when the amount of cobalt exceeded 0.1 per cent was there an appreciable increase in the temperature gradient. Similarly, a commercial cobalt-blue glass (CoO, 0.11 per cent; Fe_2O_3, 0.13 per cent) had a temperature gradient of 36°C. per inch, as compared with 45°C. and 85°C. per inch for an amber and a dark-green glass, respectively. A comparison was also made of the percentage overall light transmission at room temperature of these three colored glasses. From the results obtained, it was evident that the colored transmission of a cobalt-blue glass at room temperature could not be taken as an indication of the likely heat transmitting properties of that glass in the molten state.

The present findings have definite practical applications. It is known, for example, that the thermal performance of tank furnaces, as assessed by the method developed by the Furnace Committee of the Society of Glass Technology, is 10-15 per cent better for "amber, green and other dark colored glasses." The present investigation has shown that commercial cobalt-blue glasses

(*Continued on page* 526)

Harry W. Kuni of Glass Container Manufacturers Institute and George A. Mellor of Thatcher Glass Manufacturing Co.

ONE-WAY BEER BOTTLE CAMPAIGN

An intensive merchandising campaign, unprecedented in New England, opened when the glass container industry began promoting its new no-deposit "1-Way" beer and ale bottle on the East Coast.

Leading the campaign is a heavy newspaper advertising schedule placed in leading New England newspapers by the Glass Container Manufacturers Institute of New York. With more than two dozen brands of beer and ale now using the non-returnable bottle in New England markets, the glass manufacturers are directing their campaign at consumers. All advertising will stress the no-deposit, no-return features of the bottle and the acceptability of the glass container for use on the dining table.

To emphasize the new size and shape of the 1-Way bottle, every newspaper advertisement will picture it in actual size. The non-returnable bottle is one-third shorter and weighs only about half as much as the old style package. It is available in full quart and 12-ounce sizes.

A.C.S. REFRACTORIES DIVISION TO MEET

The Refractories Division of the American Ceramic Society has arranged a symposium on special refractories, including the refractory oxides and carbon for their Fall meeting October 10 and 11.

The Technical Session, to be held October 10, is as follows: Introduction to the Study of the Refractory Oxides by Raymond E. Birch, Harbison-Walker Refractories Company; Simple Oxide Porcelains for Jet Planes and Projectiles by R. F. Geller, National Bureau of Standards; Properties and Uses of Mullite and Pure Alumina Refractories by G. Bickley Remmey, Richard C. Remmey Sons Co.; Zircon and Zirconia Refractories by William J. Baldwin, Titanium Alloy Mfg. Company; and Carbon as a Refractory Material, F. B. Thatcher, Great Lakes Carbon Corp.

• Thatcher Glass Manufacturing Company has announced the death of Roger M. Farley, plant engineer of the Thatcher Glass Olean plant.

GLASS CONFERENCE PROGRAM

The Ninth Conference on Glass Problems, to be held at Urbana, Illinois, Thursday and Friday, December 4 and 5, 1947, will deal with problems of Fuels, Raw Materials, and Package Handling.

Following is the program for the meeting: *Fuels:* Technological Problems Attending the Use of Alternate Fuels in the Glass Industry, R. S. Arrandale, Thatcher Glass Co., Elmira, N. Y.; Economic Problems in the Use of Alternate Fuels, F. G. Schwalbe, Toledo Engineering Co., Toledo, Ohio; Natural Gas Outlook for the Glass Industry, F. T. Rainey, Ohio Fuel Gas Co., Columbus, Ohio; and Modern Gas Producers, L. L. Swift, Wellman Engineering Co., Cleveland, Ohio.

Raw Materials: Raw Materials Procurement Problems in the Glass Industry, C. L. Price, Owens-Illinois Glass Co., Toledo, Ohio; Soda Ash Outlook for the Glass Industry, J. J. Schaeffer, Wyandotte Chemicals Co., Wyandotte, Mich.; and Better Raw Materials for the Glass Industry, Axel Ottoson, Imperial Glass Co., Bellaire, Ohio.

Package Handling: Pallet Handling, Sears L. Hallett, Materials Handling Laboratories, Boston, Mass.

The Ninth Conference at Urbana marks the first presentation of this conference as a cooperative effort of the Ceramic Engineering Departments of the University of Illinois and Ohio State University. In the future, the conference will be held on alternate years in Urbana, Illinois, and Columbus, Ohio.

AGA RESEARCH REPORTS RELEASED

Two research reports have been published by the American Gas Association. One is "Research in Controlled Vacuum Heat Treating," which presents experimental data, conclusions and deductions on work done to determine the practicability of heat treating where there is no atmosphere surrounding metals during the heat treating cycle. This report constitutes the third step in a series of research projects following previous work which involved the study of heat treating when the work is surrounded by reducing atmospheres produced by the products of combustion in direct gas-fired furnaces and pioneer work of heat treating metals in prepared atmospheres.

The other report, "Literature Review of Corrosion of Metals and Materials by Flue Gas Condensate," contains a summary of the current literature and thought on the status of the causes and effects of corrosion of metals used in gas appliance construction by flue gas condensate.

BALL BROTHERS MAKES APPOINTMENT

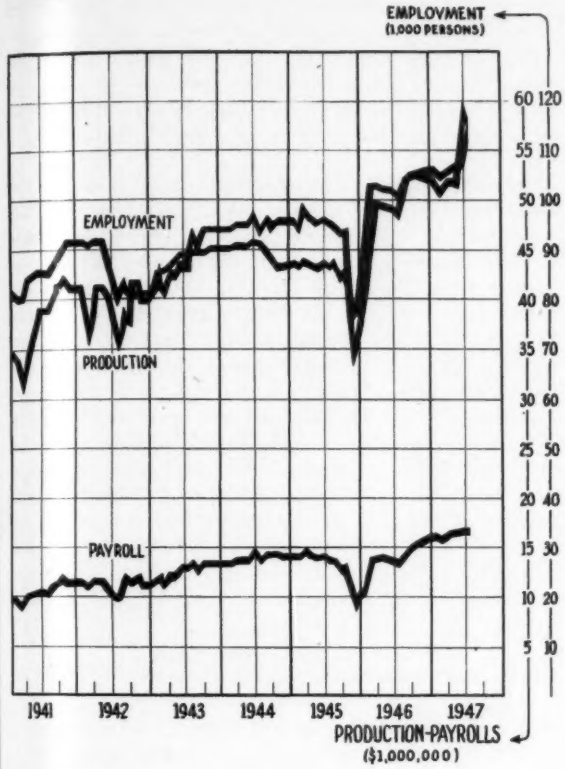
The appointment of Harold R. Clayton as Assistant General Superintendent of its Glass Division at Muncie, Indiana, has been announced by Ball Brothers Company.

Mr. Clayton has been associated with the firm for eighteen years, joining the company in 1926 as a draftsman in the engineering department. He served in that capacity for three years before he resigned to become associated with the mold department of the Illinois-Pacific Glass Company on the West Coast.

He returned to Ball Brothers Company in 1931 and was later transferred to the mold engineering department where, since 1935, and until his recent appointment as Assistant Superintendent, he had been co-ordinator between mold engineering and the Glass Division.

CURRENT STATISTICAL POSITION OF GLASS

GI THE GLASS INDUSTRY'S INDEX



July activity in the glass industry, as shown by the Production Index, fell off only slightly—about one-half of one per cent—from the estimated $59,000,000 reported for June. The estimated July figure is $58,700,000. Production during July 1946 was an approximate $48,000,000, which is about 22 per cent below July this year. Total production thus far in 1947 is an estimated $402,200,000, as compared with $332,000,000 at the close of the same period in 1946.

Employment and payrolls: Employment during the month of July dropped about 5 per cent to 113,000 persons employed. During the preceding month, the employment figure was 120,000 persons. July 1946 employment was 100,000 which is about 13 per cent below this year.

Payrolls for the month of July 1947 also decreased. The estimated figure is $16,400,000, which is close to one per cent below the $16,500,000 reported for June. The July 1946 figure was an estimated $13,000,000, or about 26 per cent below July this year. Total estimated payrolls for the first seven months of 1947 are $112,900,000, as compared with $80,000,000 paid out during the corresponding period in 1946.

Glass container production for the month of August 1947, based on figures released by the Bureau of Census, rose about 7 per cent to a figure of 9,476,209 gross. Production for the preceding month was 8,840,014 gross. During August 1946, production was 10,658,710 gross, which is about 11 per cent over August this year. Total glass container production at the close of the first eight months of 1947 is 79,873,894 gross, as compared with 76,448,215 gross produced during the same period in 1946. This represents a difference of about 4 per cent.

Shipments during August also rose and were reported to be 9,200,486 gross. This represents an increase of about 7 per cent over the 8,581,079 gross reported for July. During August 1946 shipments were 10,650,866 gross, which is about 13 per cent over August this year. Total shipments thus far in 1947 have reached 75,998,197 gross, as compared with 76,471,649 gross shipped during the same period in 1946.

Stocks on hand at the close of August 1947 are 7,300,-

GLASS CONTAINER PRODUCTION AND INVENTORY

(All figures in gross)

		Production August 1947	*Stocks August 1947*
Foods; Medicinal & Health Supplies; Chemicals, Household, Industrials; Toiletries & Cosmetics	Narrow Neck	2,889,414	3,196,714
	Wide Mouth	2,768,320	2,062,772
Dairy Products		320,547	221,763
Home Canning		*406,394	*308,849
Beverages, Returnable		1,291,143	494,178
Beverages, Non-returnable		.....	.....
Beer, Returnable		462,943	337,064
Beer, Non-returnable		493,538	251,615
Liquors		523,140	226,154
Wines		161,291	131,150
Packers' Tumblers		159,479	70,183
Total		9,476,209	7,300,442

*This figure represents Fruit Jars only.

GLASS CONTAINER SHIPMENTS

(All figures in gross)

	August 1947
Narrow Neck Containers	
Foods	1,284,524
Medicinal & Health Supplies	794,466
Chemical, Household & Industrials	408,480
Beverages, Returnable	1,212,214
Beverages, Non-returnable	.....
Beer, Returnable	291,652
Beer, Non-returnable	384,795
Liquors	468,865
Wines	157,738
Toiletries & Cosmetics	360,045
Sub-Total (Narrow)	5,362,779
Wide Mouth Containers	
Foods	2,173,491
Dairy Products	307,233
Home Canning	485,882
Medicinal & Health Supplies	219,837
Chemical, Household, Industrials	57,508
Toiletries & Cosmetics	104,206
Packers' Tumblers	148,112
Sub-Total (Wide)	3,496,269
Total Domestic	8,859,048
Export Shipments	341,438
Total Shipments	9,200,486

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For Maximum Life SPECIFY

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CAST SUPER REFRACTORY

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C.S.R. ***has excellent resistance to***

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VACUUM CAST

ACCURATE TO SIZE

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High Grade Refractories for Over 50 Years

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442 gross, as compared with 7,060,081 gross at the close of July and 3,924,890 gross at the close of August 1946.

Plate glass production during the month of August 1947, according to the Hughes Statistical Bureau, is 21,401,330 sq. ft., as compared with 17,670,240 sq. ft. produced during July. This represents an increase of about 21 per cent over July. Production during August 1946 was 16,802,955 sq. ft., which is about 27 per cent below August this year. Total production thus far this year is 169,540,209 sq. ft., as compared with 126,401,588 sq. ft. produced during the same period in 1946.

Automatic tumbler production for the month of August 1947 took a rise of more than 23 per cent, reaching a figure of 6,177,565 dozens produced. During the month of July, production was 4,993,181 dozens, and during August 1946, the figure was 7,891,004 dozens. Shipments during August also rose considerably—close to 23 per cent — to 5,330,970 dozens shipped. This is an increase over the 4,346,071 dozens shipped during the preceding month. During August 1946 shipments were 7,946,335 dozens. Stocks on hand at the close of August 1947 were 7,943,524, which is about 2 per cent over the 7,775,388 dozens on hand at the close of July. Stocks on hand at the close of August 1946 were 4,784,048 dozens. Because of lateness, one company's figures are not included in the figures for automatic tumbler production and table, kitchen and household glassware. However, the totals for this company have been estimated for the compilation of the above figures.

Table, kitchen and household glassware: Manufacturers' sales of machine-made table, kitchen and household glassware for the month of August 1947 rose slightly more than 43 per cent. Sales for August were 3,368,352 dozens as compared with 2,301,641 dozens sold the previous month. Sales during August 1946 were 4,334,632 dozens. Total manufacturers' sales during the 12-month period ending August 1947 were 42,874,262 dozens, as compared with 44,726,449 dozens sold during the same period in 1946.

RESEARCH DIGEST . . .
(*Continued from page* 523)

should not be included in the above category of colored glasses. For similar reasons, the depth of glass in a tank furnace melting blue glass and the degree of insulation or cooling applied to such a furnace should be those chosen for a colorless rather than for an amber or a dark-green glass. (Editor's note: This would seem to depend upon the iron oxide content of the blue glass. If normal, the above would be true, but if, for example, the blue glass contained, say, 0.30 per cent iron oxide, the picture would be different.)

The relatively high transmission of radiant heat through molten glasses containing cobalt oxide might conceivably be utilized to increase the transmission of molten amber or dark-green glasses where this is desirable. For example, a partial substitution of cobalt oxide for iron oxide in, say, iron-manganese glasses would probably increase appreciably the heat transmission through the molten glass without affecting materially the desired light absorption of the glass at normal temperatures.

THIS CORHART* BOTTOM HAS RUN FOR 3107 DAYS!

The Corhart* Standard Electrocast refining-end bottom shown above is now in its *sixth* campaign — on July 4, 1947, had finished 3107 operating days on flint bottle glass, and was still going strong!

The Corhart bottom blocks were originally 12″ thick, insulated with 6″ clay blocks.

Incidentally, the refining-end sidewalls are also the original Corhart Standard blocks that were installed six fires ago!

Here are the figures:

Campaign No. 1 — Aug. 29, '38 to Jan. 14, '40
Campaign No. 2 — Feb. 7, '40 to May 29, '41
Campaign No. 3 — June 23, '41 to Aug. 8, '42
Campaign No. 4 — Sept. 3, '42 to May 14, '44
Campaign No. 5 — June 15, '44 to Mar. 2, '47
Campaign No. 6 — Apr. 2, '47 to ????

This nine-year-old refining end furnishes convincing evidence that Corhart Electrocast produces maximum returns per refractory dollar.

Corhart Refractories Company, *Incorporated,* Sixteenth and Lee Streets, Louisville 10, Kentucky. . . . In Europe: L'Electro Refractaire, Paris.

*Registered trade-mark.

QUALITY ECONOMY ENDURANCE

CORHART ELECTROCAST REFRACTORIES

NEW EQUIPMENT AND SUPPLIES

OPTICAL THICKNESS MICROMETER

Instrument Development Laboratories, Inc., 541 Willis Avenue, Williston Park, Long Island, New York, has developed the PPG-IDL optical thickness micrometer for measurement of any transparent sheet material where physical access to one side only is available. The micrometer was originally developed for the Pittsburgh Plate Glass Company.

The instrument is a hand held self-contained battery-powered unit designed for use in any location. Based upon the depth of focus principle as applied to a microscope optical system, the instrument accuracy on thicknesses up to 0.275 inches is 0.0005 inches. In use, the operator may set the instrument to any of six pre-selected nominal material thicknesses and the dial reading will indicate directly the error above or below nominal thickness up to $\pm$ 0.025 inches.

To achieve accurate measurement where access can be had on one side only of sheet material, a minute lamp filament is projected down through the optical system. The filament image can be brought to a focus by reflection from the rear glass or plastic surface at the same adjustment that brings the rear surface into perfect focus. For a normal observer, the reading may be repeated within $\pm$ 0.0002 inches. This method of simultaneous imaging requires no marking of the rear surface.

For use on frosted or ground materials, a drop of index fluid may be applied to the material surface and readings taken normally. Dial illumination is provided for use in areas of restricted general lighting.

FYBRGLASS BURNISHING BRUSH

The Eraser Company, Inc., 104 S. State Street, Syracuse 2, New York, is manufacturing a Rush FybRglass burnishing brush which is said to eliminate glass breakage and to do a better and quicker job than sand.

The burnishing brush is available in a size of 1″ in diameter by 6″ long and is priced at $3.24 each delivered. Samples are available upon request.

BROWN INSTRUMENT DESIGNS NOMOGRAPH

Brown Instrument Company, Philadelphia, Pa., has designed a nomograph which determines correct sighting angles and locations for radiation measurement of extreme processing temperature.

The company believes the nomograph will replace former hit-and-miss methods for defining correct positions, such as height and angularity of a sighting element. As a result, it is stated, an accurate indication will be obtained of the area being measured without resorting to the necessity of working out the problem mathematically.

EISLER BASING MACHINE FOR LAMPS AND RADIO TUBES

The Eisler Engineering Co., Inc., Newark 3, N. J., has developed a new model of a basing machine capable of holding and basing simultaneously large and small types of incandescent lamps, radio and electronic tubes, thereby speeding up production and lowering costs.

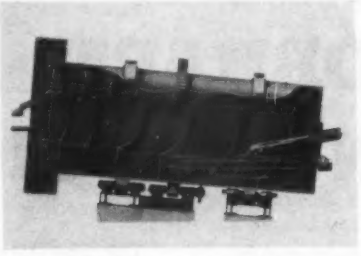
The 50-head type basing machine consists of a sturdy table structure to which a vertical drive-shaft is centrally attached. The drive shaft carries, between shafts, the top spider and the oven spider, and indirectly by means of an interposed tube, the lower spider.

The operation of the continuously revolving machine is fully automatic. The base is first filled with bakelite cement on a base filling machine and then joined with the lamp or tube. The operator's job consists only in inserting the prepared lamps or tubes into the holders and removing them after passage through the oven. The production of the machine is approximately 600 to 1000 per hour depending on the size of the bulbs.

HARDINGE CULLET WASHER

Hardinge Company, Inc., York, Pa., has found that its counter-classifier, a device normally used for separation of coarse and fine suspended solids, is particularly adapted to the washing of cullet.

The counter-classifier is an inclined,



slowly rotating cylinder with a continuous spiral baffle running the entire length of the inner shell surface. A stream of wash water pours down over various stages of this spiral baffle. Cullet fed in at the lower end of the cylinder will gradually work its way to the discharge at the upper end of the cylinder along the spiral baffle, being constantly rolled over by the cylinder walls and agitated and washed by the descending water.

WHEELCO STRIP CHART RECORDER

Wheelco Instruments Company, Chicago, Illinois, has announced the development of a new type strip chart recorder, the Capacilog, which is designed for the measurement indication control and permanent record of variables in the process industries.

Simplicity of operation without amplification, physical contact or disturbance in the measuring circuit (no relays, no converters) results in accurate and instantaneous response. Simplicity of design with a minimum of moving parts and front-accessibility throughout results in ease of service and maintenance. Operating on 115 or 230 volt, 25, 50 or 60 cycles, the Capacilog is available in a wide number of models utilizing a variety of control systems. Maximum power consumption is 60 watts.

CATALOGUES RECEIVED

The Chas. Taylor Sons Company, Dept. S, Cincinnati 4, Ohio, has issued Bulletin No. 201 containing data pertaining to the properties and uses of Taylor Zircon refractories.

All Zircon refractories are laid with troweled joints of Taylor Zircon Air-Setting Cement. They resist the chemical attack of enamel frits containing the oxides of antimony, zirconium and titanium, and are used successfully in contact with some types of high lead glazes and frits.

Standard bricks, special shapes, high temperature cements and ramming mixes are available for a variety of applications in the glass, ceramics, chemical and metallurgical fields. They are used in the melting and alloying of aluminum and precious metals; in the manufacture of phosphates by the glass process; as feeder parts and furnace refractories for the melting of highly acid glasses and as trays, plates and saggers in the firing of certain porcelains.

The Babcock & Wilcox Company, 85 Liberty Street, New York 6, New York, has published a reprint of a lecture given by the head of the Engineering and Service Department of the Refractories Division. The lecture concerned simplified methods of quickly determining the efficiency and economics of various types of refractory linings for industrial furnaces.

Fish-Schurman Corporation, 230 East 45th Street, New York 17, New York, has issued a bulletin, WL-322, describing its "Duoweld" filter lenses.

The bulletin describes the lenses, which are designed for eye protection against glare, and gives available sizes, cost and other information.

The Brown Instrument Company, Philadelphia, Pa., has published a new catalogue, "Air Operated Controllers," containing information on instruments for the automatic control of industrial processes.

Many photographs, schematic drawings and diagrams illustrate the construction and principles of operation of control instruments for temperature, pressure, flow, liquid level and humidity.

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PLANT CLOSED
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NORTH AMERICAN
DUAL-FUEL BURNING SYSTEMS
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● Switch fuel without any piping changes.
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THE NORTH AMERICAN MANUFACTURING COMPANY
CLEVELAND 5, OHIO

Miss Emily C. Van Schoick, former editor of the Journal of the American Ceramic Society, who has accepted the newly created position of librarian of the New York State College of Ceramics at Alfred University, Alfred, N. Y.

OVERMYER MOULD PERSONNEL CHANGES

Overmyer Mould Company has announced the appointment of Lowell Roesner as Vice President in Charge of Customer and Labor Relations. Formerly Vice President and General Sales Manager, Mr. Roesner has been with Overmyer Mould Company for several years, advancing from Assistant Inspector to his present position. The Customer and Labor Relations Department is a new department set up to work with Overmyer's customers as well as with their Labor Department.

At the same time, Max Hawkins, who has been Assistant Sales Manager, was named Sales Manager of all of the company's sales. Mr. Hawkins, a mould maker by trade, has been associated with the company for twenty years. Charles Manrose, who has been assistant to Mr. Hawkins, is now Assistant Sales Manager.

A. C. S. WEST COAST ACTIVITIES

The Pacific Coast Local Sections of the American Ceramic Society have arranged a Regional Meeting at Los Angeles, October 16, 17, and 18. A program consisting of over thirty papers has been prepared.

This is the first gathering of a large group interested in ceramics on the Pacific Coast since 1939. Six members of the Board of Trustees have indicated they will be present and several Past Presidents of the Society will be there. This should be the occasion for a renewal of interest in West Coast activities by the entire membership of the Society.

G.C.M.I. ANNOUNCES DATES OF SEMI-ANNUAL MEETING

The Glass Container Manufacturers Institute has announced plans to hold its semi-annual membership meeting on November 3, 4, 5 and 6 at the Sea Isle Hotel, Miami Beach, Florida.

The Board of Trustees has authorized industry meetings for November 3, 4 and 5 for the receiving of semi-annual reports from the standing committees and for the publicizing of these activities to the industry generally. The semi-annual membership meeting will be held on Thursday, November 6.

ANTI-TRUST FLAT GLASS TRIAL SET FOR JANUARY 1948

Trial of the civil anti-trust suit brought against several companies in the flat glass industry has been set for January 5, 1948 by Judge Frank L. Kloeb, presiding at a pre-trial conference, in Federal court. The court set November 3, 1947 as the filing date for submission of trial briefs.

A motion submitted by counsel for Libbey-Owens-Ford Glass Company, Pittsburgh Plate Glass Company, American Window Glass Company, Franklin Glass Corporation, Blue Ridge Glass Corporation, American Securit Company and National Glass Distributors Association, who are defendants, requesting separate trials or a severance of issues into separate consideration of five major complaints dealing with plate glass, window glass, safety glass, tempered glass and foreign competition, was overruled by the court.

The memorandum of the counsel for the glass companies declared many recent court decisions condemn "mass trials of defendants in cases involving separate claims or issues" on the grounds that substantial prejudice may result.

Judge Kloeb, in discussing the possibility of reference of the hearing to a special master, said he felt that if the case were to require six months or more of hearing time, he should refer it to a master. He asked the counsel for both sides to discuss the matter of reference to a master in their trial briefs. The court said whether or not the master were empowered to make findings and conclusions or merely take evidence and report the facts, the court would want to review the record.

Ross W. Shumaker, Toledo, counsel for Pittsburgh Plate Glass Company, told the court that the defendants would have no objection to reference to a master. Curtiss Shears, assistant to the Attorney General, said the government wanted the court to hear the case.

Mr. Shears, for the government, told the court he felt the government's case against the glass companies could be presented in 30 days of hearings. Mr. Cahill, of counsel for the defense, expressed the view that the government could not make its case, reviewing the whole glass industry for a generation on a world-wide basis, in 30 days. He said it would take the defense at least three months and possibly more depending on the case presented by the government.

The civil suit was filed in Toledo on May 23, 1945 and answers were filed by defendants on May 18, 1946. Several pre-trial conferences have been held. Corning Glass Works signed a consent decree September 5, 1946 eliminating itself and Amory Houghton and William H. Curtiss, executives of the company, as defendants.

GLASS COLORS BY PEMCO

"Now that's what I call Sales Appeal" echos and re-echos throughout those plants using Glass Colors by Pemco. In merchandising a food — a pharmaceutical — a cosmetic — a perfume, too much stress cannot be placed upon the development of the container and in glass containers COLOR is most important. Glass Colors by Pemco have been formulated in four different series — each specifically developed to add "sales appeal" to the container to which they are applied— each definitely created to solve a specific acid or alkali problem. To convince yourself of their adaptability to your needs let us send you complete details and generous samples. A request on your letter head is all that's required.

PEMCO CORPORATION

BALTIMORE 24 PEMCO **MARYLAND**

GLASS COLOR DIVISION

GLASS DIVISION MEETING . . .

(*Continued from page* 515)

by its purity, the alumina content being about 94 per cent while the iron is only 0.03 per cent. It is a dazzling white in color, light being brilliantly reflected from the faces of the crystals as well as passing completely through them. The weight is 175 lbs. per cu. ft. Castings of this mix have considerable elasticity and are, therefore, highly satisfactory for superstructure use.

Monofrax MH is a recent modification of H. The difference in composition is very slight but is sufficient to modify materially the physical structure. The alumina content is nearly 95 per cent and the iron is the same as H; namely, 0.03 per cent. Physically, its smaller crystals are very tightly integrated with the structure as a whole. It weighs 195 lbs. per cu. ft. and has a fusion point of about 1980°C. (3598°F.). Its color is also white. It is recommended particularly for direct contact with molten glass and has been used in the most vulnerable portions of the tank with marked success. (Metal line and throat.)

Monofrax K is a high alumina material (about 80 per cent Al_2O_3) with a minor amount of chrome-containing constituent. It has the greatest density of any of the three mixes, weighing 200 lbs. per cu. ft. Its fusion point is about 1980°C. (3598°F.). This mix is especially marked for its high resistance to corrosion and finds use in the melting end, including the dog-house.

Manufacturing experience with these Monofrax compositions shows that the best structure is obtained with chunky blocks weighing up to 1000 or 1200 lbs. A tank wall, therefore, can be laid up in two or three courses due both to the small dimensions of the blocks and the resistance to joint attack and upward eating.

Photosensitive Glass. *By S. D. Stookey, Corning Glass Works, Corning, New York.*

Photosensitive glass is a clear, high quality glass which, when subjected to photographic processes, reproduces permanently in the glass a photographic image with exceptional fidelity. The glass is made photosensitive in the initial mixing of the batch. The batch is melted by conventional glass manufacturing methods. The glass may be formed in any desired shape consistent with ordinary glass making: drawing, rolling, blowing, pressing, etc. It may be reworked according to conventional glass practices prior to the photographic process without deleterious effect. The unprocessed glass can be handled as any conventional glass with the provision that it not be exposed to ultraviolet rays during storage. A simple cover from sunlight normally provides the required protection.

To impart the photographic image into photosensitive glass, two photographic steps are required, exposure to ultraviolet light through an ordinary film or glass negative and development. The light source must be in the 300 to 350 mu band of the ultraviolet region. Commercial mercury or the Hanovia quartz jacketed mercury arc are suitable. Essentially parallel light and high intensity are desirable. Exposure time is dependent on the power output of the ultraviolet in the required band and the distance of the glass from the source of the ultraviolet. With an output of 2400 microwatts per sq. cm. in the required band and at a distance of 9″, average exposure time would be approximately 10 minutes. By extrapolation time of exposure for varying distances and varying power outputs can be predicted. After exposure the glass is still clear and transparent.

The latent image is developed by simple heat treatment. After heating the exposed glass to approximately 550°C, somewhat above the annealing point, the image comes into the glass. Development time varies from 5 minutes to an hour depending upon the glass composition and the desired effect. Depth of penetration and color within limits can be controlled at will by varying time of exposure and/or time of development. Development may be done at any time after exposure provided the glass is protected from additional ultraviolet exposure.

A New Optical Thickness Gauge for Flat Glass. *By L. A. Shussett, Pittsburgh Plate Glass Company, Creighton, Pa.*

The problem was to devise an instrument that would measure the thickness of flat glass rapidly and accurately from one side. In addition, the instrument should be portable, easy to operate, not require extensive preparation and should not damage the glass. After studying various methods, it was decided to use an optical device based on the principle of depth of focus.

The thickness of a glass plate can be measured by a microscope since the depth of focus of a high aperture lens is very small. The microscope is located accurately with respect to the front surface of the glass by a mechanical support and is adjusted in depth by a micrometer collar so that the rear surface of the plate is in focus. The position of the micrometer collar indicates the error in glass thickness above or below the normal thickness pre-set by selection of the proper thick glass compensating lens.

Light from a battery-powered lamp is focused on the side of a double prism. The prism is mounted in the microscope eyepiece and is provided with a 45° semi-reflecting surface which reflects light from the filament down the microscope tube. The light passes through the objective, through a lens which corrects for the presence of the glass plate and forms a reduced image of the light filament at the rear of the glass. Light from this image passes back through the microscope and is observed visually. The observer turns the micrometer collar until the filament is in sharp focus. The angular position of the collar, if properly calibrated, directly indicates the difference in glass thickness from the normal.

The accuracy of measurement of thickness by this means depends upon the following factors: 1) Numerical aperture of the objective lens; 2) Aberrations of the lens system; 3) Ability of the observer to detect error in focus; 4) Error between rear surface of glass and point of focus; 5) Wedge shape, curvature of the first surface or roughness of the first surface; 6) Error in the glass index of refraction.

Each of these items was discussed in detail and it was shown that the method and instrument as developed would measure ± 0.024″ from nominal thicknesses of 0.100″, 0.150″, 0.200″ and 0.250″ with an accuracy better than ± 0.001″.

Some Energy Relations in the Systems PbO-B_2O_3 and PbO-SiO_2. *By L. Shartsis and E. S. Newman, National Bureau of Standards, Washington, D. C.*

The compositions investigated were melted in platinum stirred with a platinum rod and poured into iron molds. Analysis for PbO was made by a triple evaporation with HF and H_2SO_4.

The heats of solution of the PbO-B_2O_3 compositions in 2.00 N HNO_3 were determined with a simple vacuum bottle calorimeter. Figure 1 shows a plot of the results obtained. The curve marked glasses represent the heat of solution of the glasses. A minimum heat of solution is shown near 60 per cent of PbO. The solid straight line represents the heat of solution of mixtures of vitreous B_2O_3 and crystalline PbO. The heat of solution of glassy PbO was obtained by extrapolating a least square line based on the heat of solution

(*Continued on page* 534)

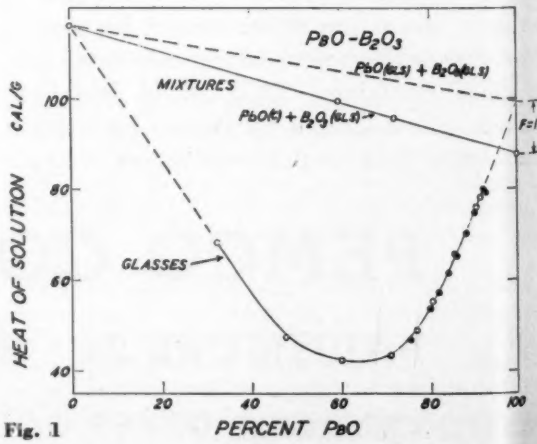

Fig. 1

Courtesy of Sharpe, Inc.

For results like this....

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PENNSALT HYDROFLUORIC ACID

MANY leading manufacturers have shown preference for Pennsalt Hydrofluoric Acid for polishing fine cut glassware. It has proven its dependability by fulfilling the most exacting requirements.

In addition to etching and polishing glassware, Pennsalt HF is valuable in frosting decorative glassware and electric light bulbs, pickling stainless steel, cleaning castings, improving the quality of glass makers' sand and other important industrial raw materials, and in the preparation of fluorine compounds.

Pennsalt HF is available in strengths of 30%, 52%, 60% and 80% for domestic users; 71-75% for export. Strengths above 60% shipped in steel containers, weaker strengths in rubber drums. Write us for full details.

ANHYDROUS HF was first produced commercially in our Easton, Pa., plant. It is used as an alkylation catalyst in production of high octane gasoline. Also used in production of organic fluorine compounds, synthesis of other organic compounds, preparation of high purity inorganic fluorine compounds. Shipped in cylinders and tank cars.

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DUST SEALED
for your
PROTECTION

You breathe pure, dust-free air in a batch room equipped with Smith Glass Batch Mixers. That's because the Smith is *dust-sealed during the entire cycle of operations* — charging, mixing and discharging. There's no chance for dust to escape. Practically eliminates the dreaded silicosis hazard. Promotes employee health and efficiency, at the same time producing quality glass batches in the shortest possible mixing period.

New 40 cu. ft. Smith Glass Batch Mixer equipped with dust boot which confines dust within mixer drum.

SCIENTIFIC MIXING OF GLASS BATCHES

The Smith duo-cone drum is famous for its effective "end-to-center" mixing action. Vertical cascading and unnecessary agitation are avoided by substituting a less violent rolling action. Segregation is eliminated, for mixing continues during the entire discharge cycle. Discharge is fast and complete. No corners or pockets in drum. No "left overs" to contaminate succeeding batches. Insures improved quality of glass batches and greater production. Built in all standard sizes up to 112 cu. ft. Write for bulletin.

The T. L. SMITH CO.
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Smith Glass Batch Mixer in discharge position. Fast "Tilt and Pour" discharge.

SMITH
T. L. SMITH CO. MILWAUKEE

Glass Batch MIXERS

GLASS DIVISION MEETING . . .
(*Continued from page* 532)

values of the glasses highest in PbO. The difference between the heat of solution of the crystalline and vitreous forms of PbO (marked F) is the heat of fusion of PbO at room temperature. The straight dashed line drawn between the value of heat of solution of glassy B_2O_3 and that of glassy PbO

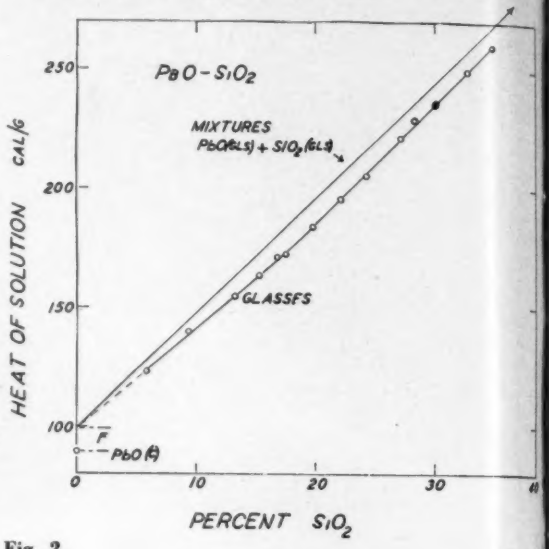

Fig. 2

represents the probable values of heats of solution of mixtures of these two oxides. The difference between the heat of solution of any composition on a "mixture" line and that of the corresponding glass can be shown to be the heat of reaction of those mixed oxides to form that glass. As can be seen from Figure 1, the heats of reaction calculated from either line have a maximum near 60 per cent of PbO.

The heats of solution of the PbO-SiO_2 compositions in a mixture of HF and 2.5N HNO_3 were measured with a precision type submarine calorimeter. The results are shown in Figure 2. It can be seen that the heats of reaction of the oxides in this system are less than in the previous one. The maximum in the heat of reaction curve occurs at about 2[illegible] per cent of SiO_2. The heat of fusion of PbO at room temperature was calculated from the average of the two systems as 2.5 K cal/mol.

CORNING EXPANDS CONSUMER PRODUCTS DIVISION

Corning Glass Works has announced the expansion of its Consumer Products Division sales organization by the opening of three new district sales offices, the appointment of a sales service manager and nine additional sales representatives.

The new offices opened are located in Dallas, Texas, Atlanta, Georgia and San Francisco, California.

Edmund W. Burke, for ten years a member of Corning's Personnel Department, has been appointed divisional sales service manager succeeding Harry R. Hemell, resigned. He will assist in the coordination of the efforts of sales representatives and district offices.

• The annual meeting of the Ceramic Association of New York State will be held at Alfred University on Saturday, October 18. The Upstate New York Section of the American Ceramic Society will meet the previous evening, October 17, at Hotel Sherwood, Hornell, New York.

WATERSIDE REFINERY

The Pacific Coast Borax Company's refinery at Wilmington, California, in Los Angeles Harbor, is one of the largest and most modern Borax refineries in the world. Here borate ore is refined into 20 Mule Team Borax, Boric Acid and other Boron compounds, and shipped throughout the world.

STRENGTH—A glass container in order to withstand the various shocks incident to filling, processing, handling, and particularly those subjected to internal pressure, must possess definite strength characteristics. B_2O_3 as a minor constituent will definitely improve the strength.

Another good reason why Borax should be used as an essential ingredient in the batch formula.

Our representatives are prepared to discuss the special advantages of B_2O_3 in glass.

PACIFIC COAST BORAX COMPANY

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GLASS TANK FURNACES

again available

The constant demand for this useful and informative book has necessitated another printing.

Glass Tank Furnaces is the only book in the English language dealing comprehensively with glass tanks. Its contents include and describe in simple language, the most modern practices in design, construction, operation, behavior and economy of glass tanks. It is a book for the factory man, the technologist and for all who are interested in the practical aspects of glass making.

Glass Tank Furnaces contains 105 figures and illustrations—75,000 words typed in two columns and produced by the lithoprint process. Cloth bound, price $4.00. Foreign $4.50, F.O.B.

The edition is limited—Send the coupon now.

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Date .....

Please enter my order for.....copies of Glass Tank Furnaces at $4.00 per copy.

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Company.....

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L-O-F PERSONNEL CHANGES

Libbey-Owens-Ford Glass Company has announced the appointment of Harold M. Alexander as assistant to David H. Goodwillie, Executive Vice President of the company.

Mr. Alexander, associated with L-O-F for thirteen years, has for the last year been assistant to the Vice President in Charge of Sales. He came to Libbey-Owens-Ford and worked in the research department after his graduation from Cornell University in 1934. In 1942 he was active in special glass sales, handled precision glass sales during the war and since the war handled sales technical service. In his new association with Mr. Goodwillie, while more directly concerned with glass factory production and technical matters, Mr. Alexander will continue as a member of the Liberty Mirror Division Operating Committee and as a member of the L-O-F Patent Committee.

Thomas A. Clarke has been named regional sales promotion manager for the Central region of the company with offices in Toledo. Mr. Clarke comes to Toledo from Dallas, where he has been on similar duties for nearly two years.

Joining the Libbey-Owens-Ford Glass Company in 1933, Mr. Clarke was made a field representative in the sales organization in 1934 at Milwaukee. Later he served at Los Angeles, San Francisco, Chicago and Kansas City.

Succeeding Mr. Clarke as regional sales promotion manager in Dallas is R. B. Davis. Mr. Davis has been field representative with headquarters in the Dallas office for two years and served at Memphis district office for a year. Prior to joining L-O-F, Mr. Davis had been in the glass business in Dallas for nine years.

PENNSALT ADDS TO RESEARCH STAFF

Samuel Spring, formerly a research specialist for the Federal Government, has joined the Research and Development staff of the Pennsylvania Salt Manufacturing Company. He will have charge of the inorganic research group at Pennsalt's Whitemarsh Research Laboratories.

Mr. Spring received his master's degree at Columbia University and for two years served on the faculty of City College of New York. He later became associated with Frankford Arsenal, where he supervised research on metal cleaners and metal-working lubricants for the last seven years.

SWISS SUBSIDIARY FORMED BY MINNEAPOLIS-HONEYWELL

The organization of a new subsidiary company in Switzerland has been announced by Harold W. Sweatt, President of the Minneapolis-Honeywell Regulator Company.

Named Honeywell A.G., the new company has started operations with completion of legal formalities and the hiring of operating personnel. The Swiss organization will handle sales and service of the complete line of Honeywell controls, as well as all of the industrial recording and controlling devices made by the Brown Instrument Company, wholly-owned Honeywell subsidiary.

• Knox Associates, Inc. has announced the appointment of H. L. Kaness as Special Representative for the Knox Group. Duties include customer contact along with sales coordination. Mr. Kaness has been Director of Central Purchases for the past five years.

UNION PACIFIC

TREASURE MAP OF INDUSTRY

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- ☆ LEADING LIVESTOCK STATE
- ☆ TREMENDOUS WOOL CLIP
- ☆ IMPORTANT MARKETING CENTER OF POULTRY AND DAIRY PRODUCTS
- ☆ LARGE PRODUCER OF SUGAR BEETS, POTATOES AND GRAINS
- ☆ EXCELLENT TRANSPORTATION
- ☆ OUTSTANDING SCENIC AND RECREATIONAL ATTRACTIONS
- ☆ HEALTHFUL LIVING CONDITIONS

One of a series of advertisements based on industrial opportunities in the states served by the Union Pacific Railroad.

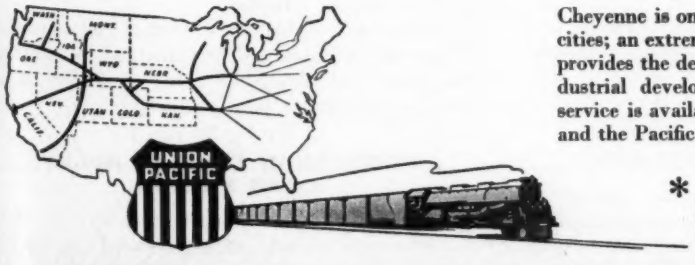
In Wyoming manufacturers will find a vast amount of raw materials. It is a leading state in potential mineral resources; produces great quantities of iron . . . has the world's largest untapped supply of coal. Copper, silver, gold, lignite and bentonite are among the mined metals and minerals. The State contains 27 oil fields and large timber lands.

Wyoming is one of the greatest of livestock States, producing fine beef cattle. Its wool clip is tremendous. Poultry raising and dairying are important activities. Principal crops are sugar beets, potatoes and grains.

The healthful climate . . . scenic and recreational attractions such as Yellowstone-Grand Teton National Park and scores of dude ranches . . . a fine educational system . . . are incentives to living in this western region.

★ ★ ★ ★

Cheyenne is one of the principal Union Pacific mainline cities; an extremely important point to the railroad which provides the dependable transportation so essential to industrial development. For travelers, daily Streamliner service is available from Cheyenne to and from Chicago and the Pacific Coast.



* *Address Industrial Department, Union Pacific Railroad, Omaha 2, Nebraska, for information regarding industrial sites.*

UNION PACIFIC RAILROAD

THE STRATEGIC MIDDLE ROUTE

MICRO-ANALYSIS OF GASES IN GLASS . . .

(*Continued from page* 517)

and immediate change of color from brown to yellow indictates the presence of water or water vapor.

Disadvantages of the Method

The chief of these is that some of the gases encountered are appreciably soluble in glycerin alone. This sulphur dioxide is very readily soluble, hydrogen sulphide appreciably so, and carbon dioxide fairly so. The presence of any of these, but especially of the first, therefore reduces the accuracy of the results. The solubilities of the remaining gases are lower and have little effect in the time normally taken for an analysis.

Other disadvantages are that a tendency towards decomposition has been observed on the part of some of the reagents, that the bubbles are not quite spherical, as is assumed in making the calculations, and that there may be a small error in making the measurements. A way, although rather a laborious one, of allowing for these errors (except the decomposition of the reagents, which is thought to be affected chiefly by temperature changes) is to make analyses of a systematic series of mixtures the compositions of which are already known. The accumulation of a series of such results would in time greatly increase the usefulness of the method and the analyst's confidence in the accuracy of his results.

Applicability of the Method

The method is capable of providing valuable information where great accuracy is not needed, but it deals only with inorganic gases, and in the present instance has been applied exclusively to the examination of glass, for which it is particularly adapted. There is no reason, however, why it should not be useful under other conditions in which gaseous mixtures are confined in a small space from which they can easily be released.

Reagents

(1) *Cadmium acetate soln.:* 10 g of cadmium acetate in 100 ml of anhydrous glycerin. (2) *Potassium hydroxide soln.:* 10 g of potassium hydroxide in 100 ml of anhydrous glycerin. The dishes containing this and the previous soln. should be kept in a desiccator when not in use. (3) *Sodium hydrosulphite soln.:* 0·5 g of sodium hydrosulphite ($Na_2S_2O_4$) is dissolved in 3 ml of a soln. containing 40 g of postassium hydroxide in 277 ml of water. (4) *Cuprous chloride soln.:* 11·25 g of ammonium chloride are dissolved in a mixture of 14 ml of ammonia (sp. gr. 0·880) and 33 ml of water, and 9 g of freshly purified cuprous chloride are added. Both this and the previous soln. may conveniently be stored in an atmosphere of nitrogen. (5) *Colloidal palladium soln.:* 0·06 g of solid palladium preparation is dissolved in 4·35 ml of a sat. soln. of sodium picrate.*

*The colloidal palladium preparation is made as follows: Dissolve 0·5 g of palladium chloride by boiling in a mixture of 8 ml of water and 2·5 ml of 2 *N* hydrochloric acid. Also, dissolve 0·65 g of sodium protalbinate (see below) in 16 ml of water and add 10 ml of approx. 2 *N* sodium hydroxide, followed by the soln. of palladium chloride (slow addition). Add slowly an excess (about 5 ml) of a 50% aq. soln. of hydrazine hydrate. This causes the soln. to turn black, with evolution of nitrogen. Dialyse the resulting liquid in diffusion shells for 3 days. During the first day use running tap water, followed on the second and third days by twice-daily changes of distilled water. At the end of the period remove the soln. from the shells and evaporate it to dryness in a vacuum desiccator over fused calcium chloride. It forms black shining plates, soluble in water.

The sodium protalbinate is made as follows (Paal)[6]: Add 100 g of egg albumin in small portions to a soln. of 15 g of sodium hydroxide in 500 ml of water in a flask. Distribute the albumin uniformly by shaking, and heat the mixture on the water-bath until everything has dissolved, except a small flocculent residue; this takes about 1 hr. During the heating there is a continuous evolution of ammonia. Next filter the soln. and treat the alkaline filtrate in a large dish with dil. acetic acid as long as a ppt. forms. During the addition of the acid the strongly foaming mass gives off considerable quantities of hydrogen sulphide. After about 12 hr. collect the protalbinic acid (which will have settled, partly in fine flocks and partly in larger white lumps) on a filter and wash with a little water. Dissolve the protalbinic acid in the min. amount of sodium hydroxide soln., and dialyse the resulting soln. for 3 days. Then concentrate the soln. and carry out the final evaporation in a vacuum desiccator. The residue of solid sodium protalbinate is a white amorphous powder or a yellow brittle vesicular mass.

6. Paal, C., *Ber.*, 1902, *35*, 2195.

SYLVANIA VICE PRESIDENT NAMED DIRECTOR OF BRITISH AFFILIATE

Grenville R. Holden, Vice President of Sylvania Electric Products, Inc., has been elected to the Board of Directors of Electronic Tubes Ltd. of London, a British radio tube manufacturing affiliate of Sylvania.

For some time past, Mr. Holden has represented Sylvania in negotiations abroad, which have resulted in the establishment of new manufacturing facilities in cooperation with companies in other countries. In addition to these duties, Mr. Holden will continue to carry on his general corporate responsibilities at Sylvania's headquarters in New York.

CLIPPER MANUFACTURING OPENS FACTORY BRANCH IN CLEVELAND

The Clipper Manufacturing Company has opened a branch office at 208 Noble Court in Cleveland, Ohio. The new factory warehouse and office will carry a complete stock of Clipper Saws, Hoists and Blades to provide overnight delivery service to the surrounding states.

William E. Davis has been appointed District Manager and Robert M. Stubbs, Office Manager.

M.I.T. ESTABLISHES COURSE IN COLLOID CHEMISTRY OF SILICON

The establishment of a course in the colloid chemistry of silicon has been announced by the Massachusetts Institute of Technology. The new course, which will begin this fall under the direction of Dr. Ernst A. Hauser, Associate Professor of Chemical Engineering, will be a survey of the chemical and physical properties of substances containing silicon as their basic constituent in correlation with their molecular structure.

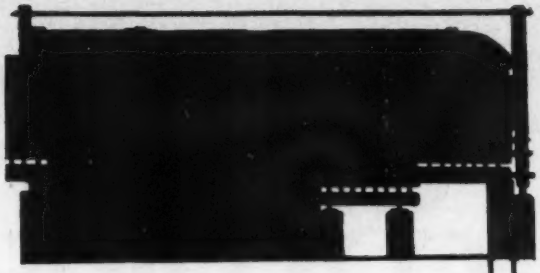
The importance of this new branch of colloid chemistry to science and industry will be explained by offering examples from such diversified fields as studies of glass, ceramics, paper, rubber, flow, plastics, etc.

PITTSBURGH CORNING HOLDS SALES SESSION

Pittsburgh Corning Corporation held a four-day training and sales session recently which included the inspection of manufacturing operations, as well as sales training.

The sales personnel made a tour of both the glass block and Foamglas plants located at Port Allegany, while the remaining time was devoted to sales and training sessions.

COORDINATED CONTROL ... *pays off*



● Below you see a modern instrument panel for control of glass tanks. These complete coordinated control systems are being installed only because they pay off in lower costs, higher quality and greater production.

Coordinated control standardizes the many variable conditions that affect glass production. Continuous capacity production is achieved with a minimum of feeding or forming difficulties. Costs are further reduced by longer furnace campaigns, better refractory life and fuel savings. All are made possible by Brown Glass Tank Control.

Brown engineers have developed considerable instrument equipment exclusively for glass making processes. The experience of these engineers in Glass Industry practices is available by writing or telephoning your local Brown engineer.

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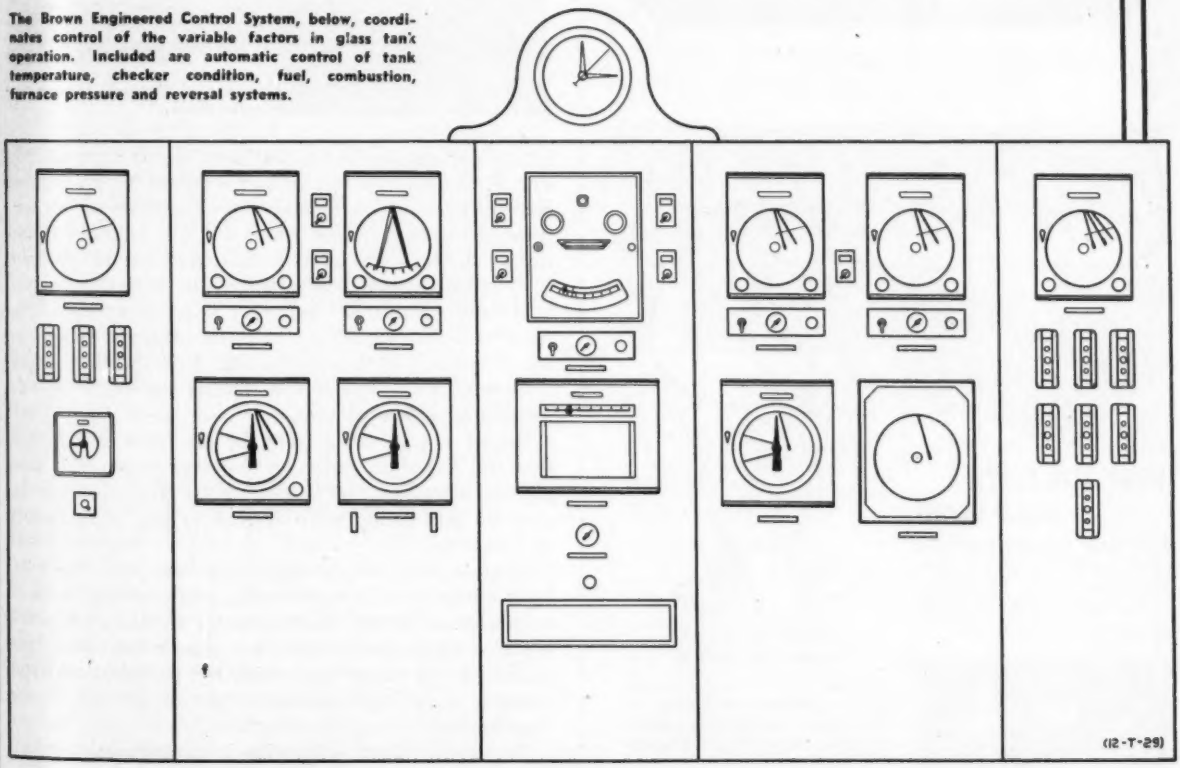
DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR CO.

SUBSIDIARY COMPANIES IN TORONTO · MEXICO CITY · LONDON · STOCKHOLM · AMSTERDAM · BRUSSELS

The Brown Engineered Control System, below, coordinates control of the variable factors in glass tank operation. Included are automatic control of tank temperature, checker condition, fuel, combustion, furnace pressure and reversal systems.



Instruments by **BROWN** *and Controls by*

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BETTER ALKALI RESISTANCE

FASTER FIRING
BETTER COVERAGE
MAXIMUM BRILLIANCE
PERMANENT SUSPENSION

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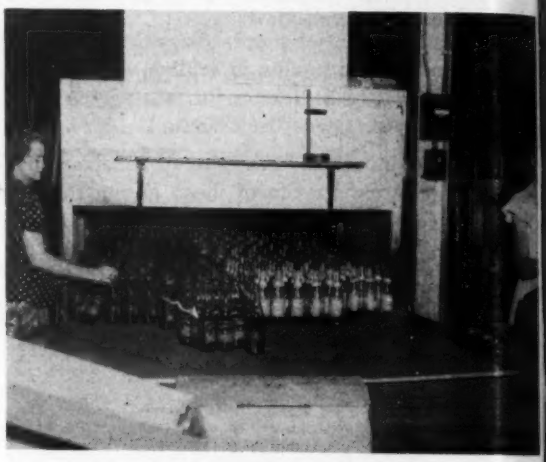
FREE
WRITE FOR LITERATURE

DECORATING AT LAURENS . . .

(*Continued from page* 512)

women who work with the decorating machines. Added speed and convenience is achieved by teamwork; each operator faces the bottle in a certain way on the conveyor so that the next girl can place it on her machine with little or no turning required.

As the ware reaches the end of the line, each label is carefully inspected for register, proper heaviness of color, etc. This is done by the lehr loader, who places the off ware on a tray and the accepted bottles on the lehr. Rejects are buffed to remove the color and then used again. The lehr is a Hartford-Empire MD gas-fired deco-



Two kinds of bottles, Royal Crown and Pepsi-Cola, are unloaded from the lehr from opposite sides.

rating lehr that builds up to a fusing temperature of 1260 deg. F. Slightly over two hours is required for the process. The fusing stage is reached about two-fifths of the way through the tunnel, after which the heat is gradually diminished. The ware travels at the rate of 9 to 10" per min.

To maintain even temperature, the bottles are placed uniformly on the lehr conveyor belt. Since each lehr handles the output of two or three lines, the ware does not come to it at a uniform rate. It is therefore necessary to fill empty spaces with dummy bottles to maintain an even firing temperature.

Bottles are unloaded from the lehr directly into cartons and placed on pallets for shipment or storage. During the unloading, the bottles receive final thorough inspection and faulty ware is sent to the glass factory cullet pile.

The company has developed a system that allows 24-hour operation of the decorating plant without a break in production at any time during the six-day week. Each operator on the production line takes a five-minute rest period during every hour, with the periods timed successively according to the movement of the ware on the conveyor belt.

A uniform rate of production is carried on throughout the year.

The management has instituted a successful bonus system for the operators. Each shift is assigned a quota figure for the eight-hour period and a bonus is paid for all production over that figure.

The decorating department is headed by James C. Spears. J. "Mack" Davis is in charge of the screen

department. To handle the five production lines, each shift requires a foreman, an assistant foreman and 22 operators. Including the truckers, washers, etc., about 100 people are employed in the decorating building.

The Laurens plant, of which the decorating department is a part, is chiefly equipped for the production of soft drink bottles, although a small amount of wide mouth ware is also produced.

OWENS-CORNING APPOINTMENTS

John H. Thomas will succeed George E. Gregory as Vice President and Purchasing Director of Owens-Corning Fiberglas Corporation and Ben S. Wright will become General Sales Manager, according to a recent announcement made by Harold Boeschenstein, President of the Fiberglas Corporation.

These changes were made following the resignation of Mr. Gregory to become President of the Morton-Gregory Company, Inc., a new organization being formed to manufacture and sell new industrial and consumer products calling for large scale use of Fiberglas yarns.

Ben S. Wright

Mr. Thomas has been Owens-Corning's Vice President in charge of Sales since 1946. He has been with the firm since it was organized in 1938 and prior to that was identified with Owens-Illinois research activities.

Joining Owens-Corning in 1940, Mr. Wright was assigned to the general office sales organization as Manager of the Fiberglas yarns division. In 1945 he became Manager of the Fiberglas branch sales office in Cleveland.

Mr. Gregory was one of the original pioneers in the commercial development of the Fiberglas Corporation. He came to Owens-Corning from Corning Glass Works in 1938, and became successively General Sales Manager, Director of Sales and then Vice President of Owens-Corning.

L-O-F NAMES HEAD OF SALES TECHNICAL SERVICE

The promotion of Otto F. Wenzler to Manager of the sales technical service department has been announced by Libbey-Owens-Ford Glass Company.

Mr. Wenzler, who has been active in product promotion work with the company for eight years, was formerly chief draftsman in the design department and five years ago started the product promotion department. During the war years he worked on development of metl-flex and other special glasses for radar equipment.

The department Mr. Wenzler now heads is a clearing house for all technical information on specifications and uses of products; it investigates all new uses of company products, and works closely with the Development division of the Technical Department in supplying technical information to the company's sales and factory staffs and its glass distributors.

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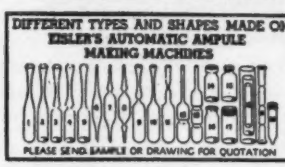
Glass Work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THE NEFF & FRY CO.

CAMDEN, OHIO

NEFF & FRY STORAGE BINS

INVENTIONS & INVENTORS . . .
(*Continued from page* 521)

vacuum tight sealed-in metal leads. This is done by drawing a rod of hot glass from a pot and winding it over a mandrel which may be made of graphite or an alloy known as "B-100" made by the Crucible Steel Company of America. In one form of the invention the solid glass coil is taken off the mandrel in single turns and placed in molding dies which form the finished article. An especial method of cutting these coils has been provided. Also a new machine is shown for making the headers.

Fig. 3 shows what is called a furnace 1 containing a crucible 2 of molten glass 2. A rod of glass 7 which is called a "pull" is drawn upwardly in the same way that cane is usually drawn. This is wound around a mandrel 8 and, as it hardens, it moves off to the right in the direction of the dotted arrow B. The mandrel is water cooled. A thin plate above the mandrel directs this movement. The mandrel may be shaped to suit the form of the finished article, that is, round, octagonal or any other shape.

The glass rings after being cut are placed in position with the pins, in an automatic machine where they are reheated and pressed into the final form.

This patent is a continuation-in-part of the application resulting in Patent No. 2,342,609 and an application filed Jan. 16, 1942. The glass coils are claimed in an application filed June 16, 1947.

The following references are of record in the file of this patent: United States Patents: 2,030,185, Rose, Feb. 11, 1936; 2,251,726, Wellech et al., Aug. 5, 1941; 1,679,437, Middendorf, Aug. 7, 1928; 2,312,003, Schneider et al., Feb. 23, 1943; 2,195,485, Franke, Apr. 2, 1940; 2,296,321, Wellech, Sept. 22, 1942; 1,574,482, Hirsch, Feb. 23, 1926; 2,342,609, Ellefson, Feb. 22, 1944; 1,301,714, Kueppers, Apr. 22, 1919; 2,177,743, Pfaff, Oct. 31,1939; and 2,209,739, Meyer, July 30, 1940. Foreign Patents: 154,609, Germany, Oct. 4, 1904.

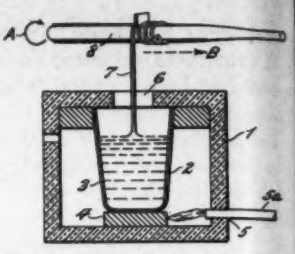

Fig. 3. Glass Headers for Electron Tubes.

AMERICAN WINDOW GLASS TO OPERATE OKLAHOMA PLANT

As part of an expansion program, the American Window Glass Company will put its Okmulgee, Oklahoma plant into operation. Officials of the company have been contemplating operating this factory for some time. It will be known as Factory No. 3 and will make a total of four factories that the company will have in operation.

Contracts are being let for the necessary alterations and work will begin at once so that the plant may be placed in operation at the earliest possible date. The Frisco Railroad and the Okmulgee Northern Railroad will serve the factory with existing and extended spurs to the plant site. Present plans contemplate starting operations early next Spring with three Fourcault sheet glass drawing machines. The company expects to spend in excess of $1,000,000 on the Okmulgee plant, which will finally employ about 500 men.

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STAFF CHANGES AT UNIVERSITY OF ILLINOIS

With the start of the new semester at the University of Illinois, several new appointments and changes in both the teaching and research staff have been made.

E. D. Lynch has been appointed Assistant Professor in Ceramic Engineering, while R. J. McEvoy has been appointed as an Assistant in the Department of Ceramic Engineering. By recent action of the Board of Trustees, Dr. R. L. Cook was promoted from Associate Professor to Professor of Ceramic Engineering.

George F. Stockdale has been appointed Research Assistant Professor in Ceramic Engineering. Dr. W. R. Morgan recently joined the staff as Special Research Professor and is cooperating with Prof. R. K. Hursh in carrying out a research project for the Industrial Research and Development Division of the Department of Commerce.

C. D. Brunner has been appointed to the Orton Fellowship for the coming year.

PITTSBURGH CORNING'S SOLID GLASS BLOCK AGAIN AVAILABLE

The manufacture of solid glass block, which was a wartime casualty, has begun again by the Pittsburgh Corning Corporation. It is expected that the solid block will be available for shipment on or after October 1, 1947.

Prior to the war, this block had found many special uses in plating, as insulating supports for acid and electrolytic tanks, and similar operations. They found wide acceptance in the novelty trade for bookends, door stops, etc. The size of the solid block is 5" x 5" x 2⅝".

PENNSALT NAMES SUPERVISOR OF DEVELOPMENT

The appointment of Dr. Ford R. Lowdermilk as Supervisor of the Development Division in the Research and Development Department has recently been announced by Pennsylvania Salt Manufacturing Company. Dr. Lowdermilk replaces Frank R. Murphy, who was recently appointed Assistant Production Manager in the company's Manufacturing Department.

Prior to joining Pennsalt, Dr. Lowdermilk was associated with the Barrett Division of the Allied Chemical and Dye Corporation in the Research and Development Department and as Technical Assistant to the Chief Chemical Engineer.

CLASSIFIED ADVERTISEMENTS

HELP WANTED

Prominent Mid-Western glass company will consider applicants with sound technical education or experience for positions in research and development. Reply Box 61, c/o The Glass Industry, 55 West 42nd Street, New York 18, New York.

PRODUCTION MANAGER wanted by medium size Glass Container firm manufacturing a general line of medicinal, toilet and proprietary bottles. He must have necessary experience in supervision of men and a thorough knowledge of operating Hartford-Empire equipment. Give full particulars, including age and salary expected, when applying to Box 64, c/o The Glass Industry, 55 West 42nd Street, New York 18, N. Y.

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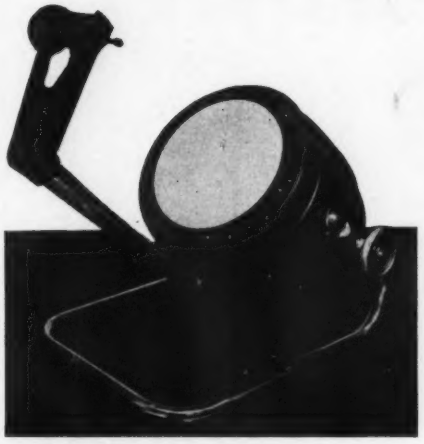

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*T.M. Reg. U.S. Pat. Off.

ALLAN J. ANDERSON TO MANAGE AMERICAN POTASH TRONA PLANT

The appointment of Allan J. Anderson as Manager of its Trona plant has been announced by American Potash & Chemical Corporation.

Mr. Anderson joined the Trona plant as a research chemist in 1923. He was named general foreman in 1927 and became production manager in 1944. He was appointed assistant Trona manager in 1946.

After completing his college education, Mr. Anderson took a position as a junior draftsman with the Granby Consolidated Mining, Smelting and Power Company in British Columbia. He left the Granby firm to join American Potash and Chemical Corporation.

THE SHARP-SCHURTZ COMPANY

CHEMISTS AND CONSULTING ENGINEERS

FOR THE GLASS INDUSTRY

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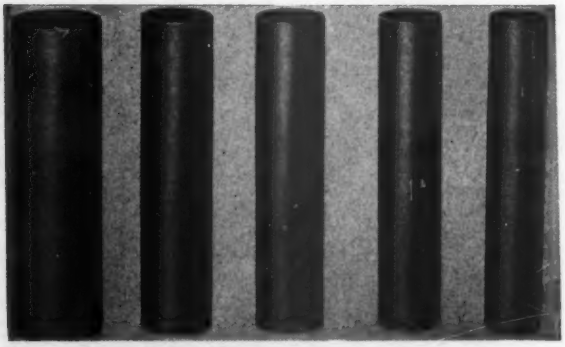

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STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUGUST 24, 1912, AND MARCH 3, 1933

THE GLASS INDUSTRY, published monthly at 55 West 42nd Street, New York 18, N. Y., for October 1, 1947, State of New York, County of New York, ss:

Before me, a Notary Public in and for the State and County aforesaid, personally appeared John T. Ogden, who, having been duly sworn, according to law, deposes and says that he is the Publisher of THE GLASS INDUSTRY and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: John T. Ogden, publisher, 55 West 42nd Street, New York 18, N. Y. Cyril B. Delgado, editor, 55 West 42nd Street, New York 18, N. Y. Managing editor, none. Cyril B. Delgado, business manager, 55 West 42nd Street, New York 18, N. Y.

2. That the owners are: Ogden Publishing Company, 55 West 42nd Street, New York 18, N. Y. John T. Ogden, 55 West 42nd Street, New York 18, N. Y. Katherine Waller Ogden, 55 West 42nd Street, New York 18, N. Y.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of the total amount of bonds, mortgages, or other securities are: None.

4. That the two paragraphs next above giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has not reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

(Signed)
JOHN T. OGDEN, *Publisher.*

Sworn to and subscribed before me this 10th day of September, 1947.

Irving A. Honig
Notary Public, Queens County
Queens Co. Clk's No. 932
New York County Clk's No. 170
Commission Expires March, 30, 1948